Operation & Service Manual

Envoy
Lane Machine

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Envoy Lane Machine Operation & Service Manual

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Section 1: SAFETY!

NOTES & WARNINGS

Throughout this publication, “Warnings”, and “Cautions” (accompanied by one of the International HAZARD Symbols) are used to alert the mechanic to special instructions concerning a particular service or operation that may be hazardous if performed incorrectly or carelessly. They are defined below. OBSERVE AND READ THEM CAREFULLY!

These “Safety Alerts” alone cannot eliminate the hazards that they signal. Strict compliance to these special instructions when performing the service, plus training and “Common Sense” operation are major accident prevention measures.

NOTE or IMPORTANT!: Will designate significant informational notes.

WARNING! Will designate a mechanical or nonelectrical alert which could potentially cause personal injury or death.

WARNING! Will designate electrical alerts which could potentially cause personal injury or death.

CAUTION! Will designate an alert which could potentially cause product damage.

Will designate grounding alerts.

SAFETY NOTICE TO USERS OF THIS MANUAL

This manual has been written and published by the Service Department of Brunswick Bowling and Billiards to aid the reader when servicing or installing the products described.

It is assumed that these personnel are familiar with, and have been trained in, the servicing or installation procedures of these products, which includes the use of common mechanic’s hand tools and any special Brunswick or recommended tools from other suppliers.

We could not possibly know of and advise the reader of all conceivable procedures by which a service might be performed and of the possible hazards and/or results of each method. We have not attempted any such wide evaluation. Therefore, anyone who uses a service procedure and/or tool, which is not recommended by Brunswick, must first completely satisfy himself that neither his nor the product’s safety will be endangered by the service procedure selected.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication.

It should be kept in mind, while working on the product, that the electrical system is capable of violent and damaging short circuits or severe electrical shocks. When performing any work where electrical terminals could possibly be grounded or touched by the mechanic, the power to the product should be disconnected prior to servicing and remain disconnected until servicing is complete.

GENERAL SAFETY PRECAUTIONS

In addition to the warnings and cautions provided within the manual, you should understand and follow these general principles for safe machine operation.

CAUTION! Do not operate with an extension cord or power cord other than the one provided with this machine.

WARNING! Get a partner to help in lifting and lowering to avoid back injury. Take care when lifting or lowering this machine into transport position. Use proper lifting and lowering techniques. Make sure to bend at the knees and use a back support, if needed.

WARNING! Be sure the building's power supply provides properly grounded receptacles and the correct voltage and amps for this machine: 115V, 20A or 230V, 15A service.

WARNING! Do not attempt to make any wiring modifications.

CAUTION! Replace fuses with those of the same specifications listed in the wiring diagram in the Appendix of this manual.

CAUTION! Use only cleaners and conditioners intended for use with this machine.

WARNING! Do not allow fluid to enter the electrical enclosure or come in contact with electrical components.

WARNING! Always undertake maintenance operations away from the approach to avoid spilling liquids on the approach and clean up any drips or spills immediately.

CAUTION! Manage the power cord so that it does not get trapped under the lane machine. Replace the protective sleeve and heat shrink tubing on the power cord if they become damaged.

WARNING! Never use any batteries, other than the type supplied with the machine or other options authorized by Brunswick. Mixing battery types or using batteries that are different from what is supplied with the machine may damage the machine and cause serious injury or death to the operator. Use of alternate batteries, power supplies or chargers will void the machine warranty.

1. This product is intended only for use in commercial bowling centers and by a trained operator.

2. Do not attempt to undertake any maintenance or service for which you are not qualified.

3. Contact your Brunswick Sales or Service Representative if you are interested in receiving training.

4. Do not overfill tanks.

5. Be sure all components are dry before supplying power to the machine.

6. If you need assistance, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

7. This product should only be operated in 40°F to 105°F (5°C to 40°C) ambient air temperature, in relative humidity not exceeding 50%, and at altitudes up to 6560 feet (2000m) above mean sea level.

8. Transportation and storage temperatures should not exceed -10°F to 130°F (-25°C to +55°C) and should not exceed 160°F (70°C) for more than 24 hours.

9. This machine is designed and manufactured to provide many years of dependable service. Industry experience and common sense are important factors to ensure optimal reliability.

GROUNDING

This Class I, Single-Phase lane cleaning/conditioning machine must be grounded while in use to protect the operator from electric shock. The machine is provided with a three-conductor cord and a three-contact grounding-type attachment plug to fit the proper grounding-type receptacle. The GREEN/YELLOW conductor in the cord is the grounding wire. Never connect this wire to any other terminal than the grounding pin of the attachment plug.

A 15Amp, 120-Volt nominal AC input grounding plug is supplied on the power cords as shown in the Figure 1-1. Make sure that the machine is connected to an outlet having the same configuration as this plug when your center is supplied with 120-Volt nominal AC, single phase power.

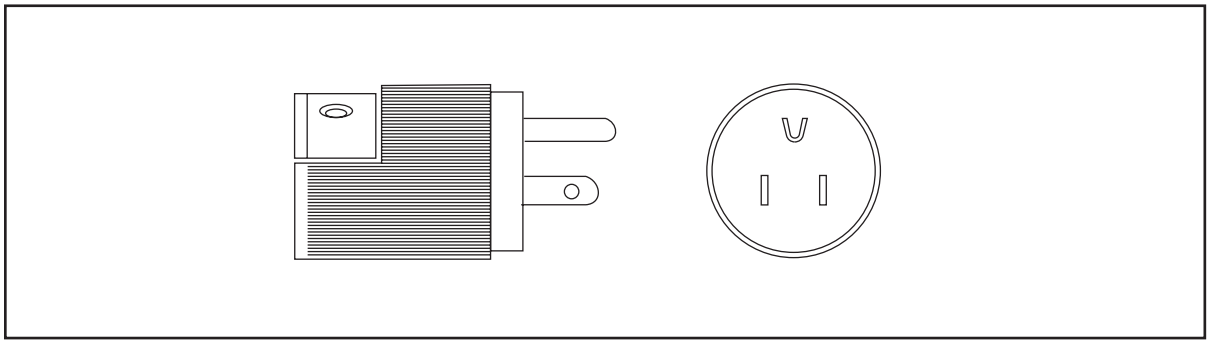


Figure 1-1

A 16Amp, 230-Volt nominal AC input grounding Schuko type plug is supplied on the power cord for international Envoy shipments as shown in Figure 1-2. If you need to replace this plug or use an adapter, make sure that the black wire is connected to the “line” terminal, the white wire is connected to the “neutral” terminal and the green wire is connected to the “ground” terminal.

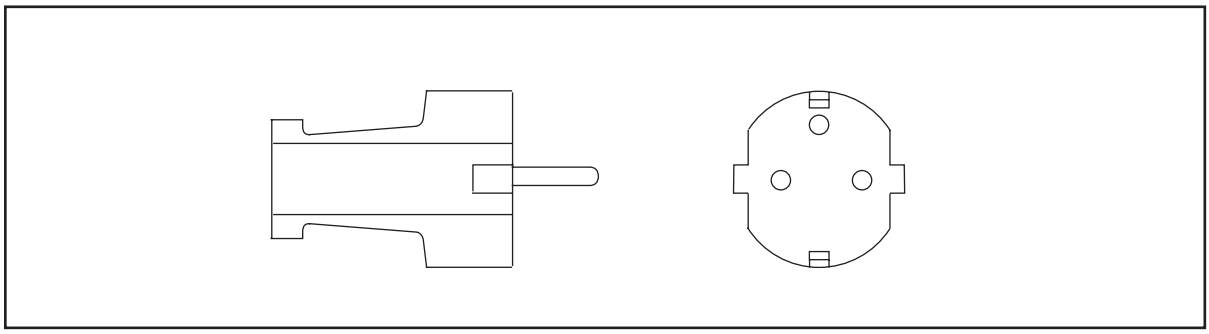


Figure 1-2

MACHINE DECALS

Daily Maintenance (reorder part number 14-100472-000), Serial Number, Cautions (reorder part number 14-100146-000), Charger Connections (reorder part number 14-100954-000) and BTS/Warranty Contact (reorder part number 14-100425-000) decals are located on the lane machine as shown in Figures 1-3 and 1-4. Please make sure that you understand and are familiar with the instructions on these decals before operating or servicing this lane machine. If you need assistance or replacement decals, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com.

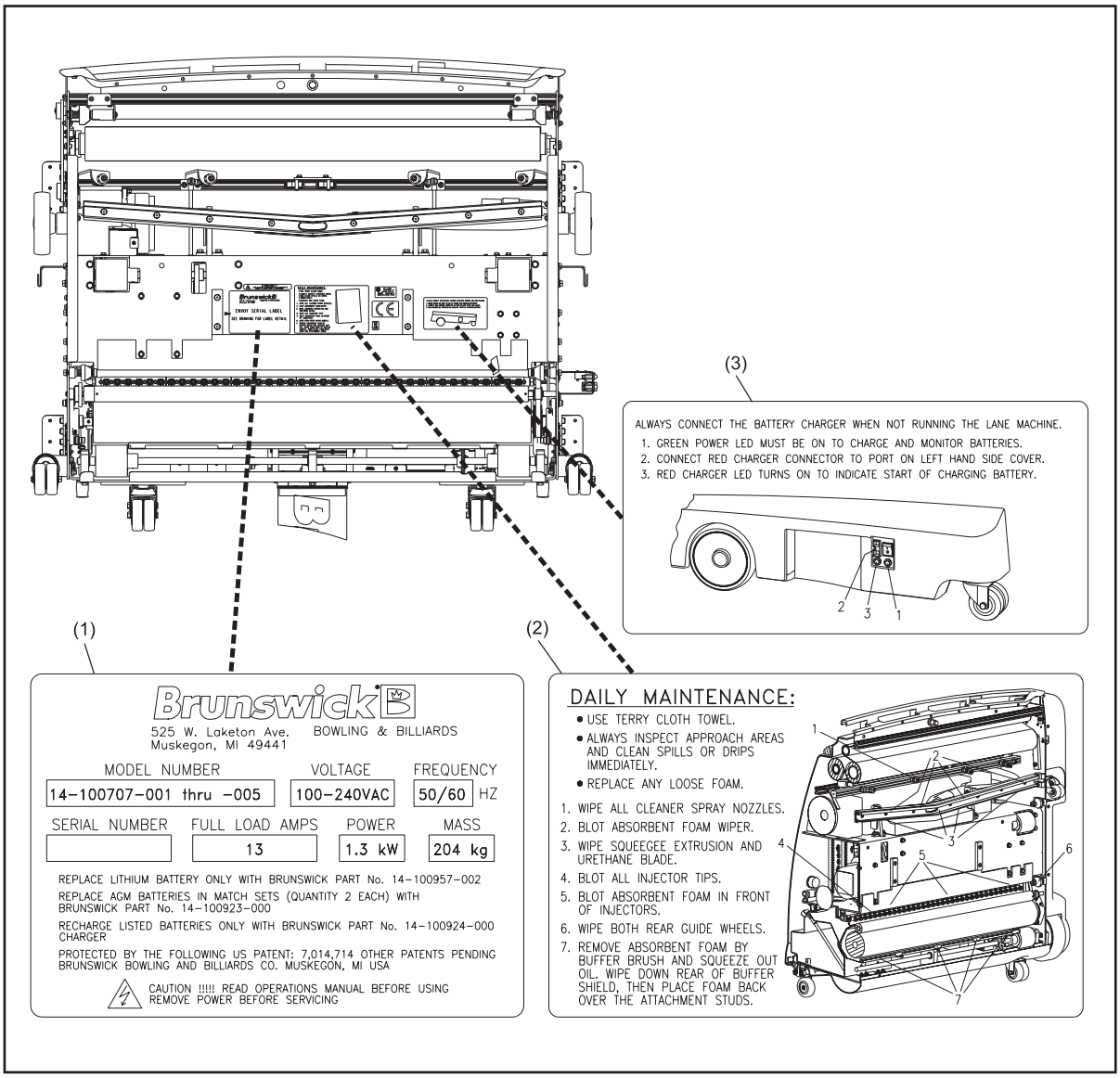

(3)
ALWAYS CONNECT THE BATTERY CHARGER WHEN NOT RUNNING THE LANE MACHINE.
1. GREEN POWER LED MUST BE ON TO CHARGE AND MONITOR BATTERIES.
2. CONNECT RED CHARGER CONNECTOR TO PORT ON LEFT HAND SIDE COVER.
3. RED CHARGER LED TURNS ON TO INDICATE START OF CHARGING BATTERY.
2 3 1
(1)
(2)
Brunswick
525 W. Laketon Ave.
Muskegon, MI 49441
BOWLING & BILLIARDS
MODEL NUMBER
VOLTAGE
FREQUENCY
14-100707-001 thru -005
100-240VAC
50/60 HZ
SERIAL NUMBER
FULL LOAD AMPS
POWER
MASS
13
1.3 kW
204 kg
REPLACE LITHIUM BATTERY ONLY WITH BRUNSWICK PART No. 14-100957-002
REPLACE AGM BATTERIES IN MATCH SETS (QUANTITY 2 EACH) WITH BRUNSWICK PART No. 14-100923-000
RECHARGE LISTED BATTERIES ONLY WITH BRUNSWICK PART No. 14-100924-000 CHARGER
PROTECTED BY THE FOLLOWING US PATENT: 7,014,714 OTHER PATENTS PENDING BRUNSWICK BOWLING AND BILLIARDS CO. MUSKEGON, MI USA
CAUTION !!!!! READ OPERATIONS MANUAL BEFORE USING
REMOVE POWER BEFORE SERVICING
DAILY MAINTENANCE:
• USE TERRY CLOTH TOWEL.
• ALWAYS INSPECT APPROACH AREAS AND CLEAN SPILLS OR DRIPS IMMEDIATELY.
• REPLACE ANY LOOSE FOAM.
1. WIPE ALL CLEANER SPRAY NOZZLES.
2. BLOT ABSORBENT FOAM WIPER.
3. WIPE SQUEEGEE EXTRUSION AND URETHANE BLADE.
4. BLOT ALL INJECTOR TIPS.
5. BLOT ABSORBENT FOAM IN FRONT OF INJECTORS.
6. WIPE BOTH REAR GUIDE WHEELS.
7. REMOVE ABSORBENT FOAM BY BUFFER BRUSH AND SQUEEZE OUT OIL. WIPE DOWN REAR OF BUFFER SHIELD, THEN PLACE FOAM BACK OVER THE ATTACHMENT STUDS.
1 2 3 4 5 6 7

Figure 1-3. Serial Number and Daily Maintenance Decal Locations

(1) SERIAL # DECAL
(2) DAILY MAINTENANCE DECAL (REORDER PART NUMBER 14-100472-000)
(3) CHARGER CONNECTION DECAL (REORDER PART NUMBER 14-100954-000)

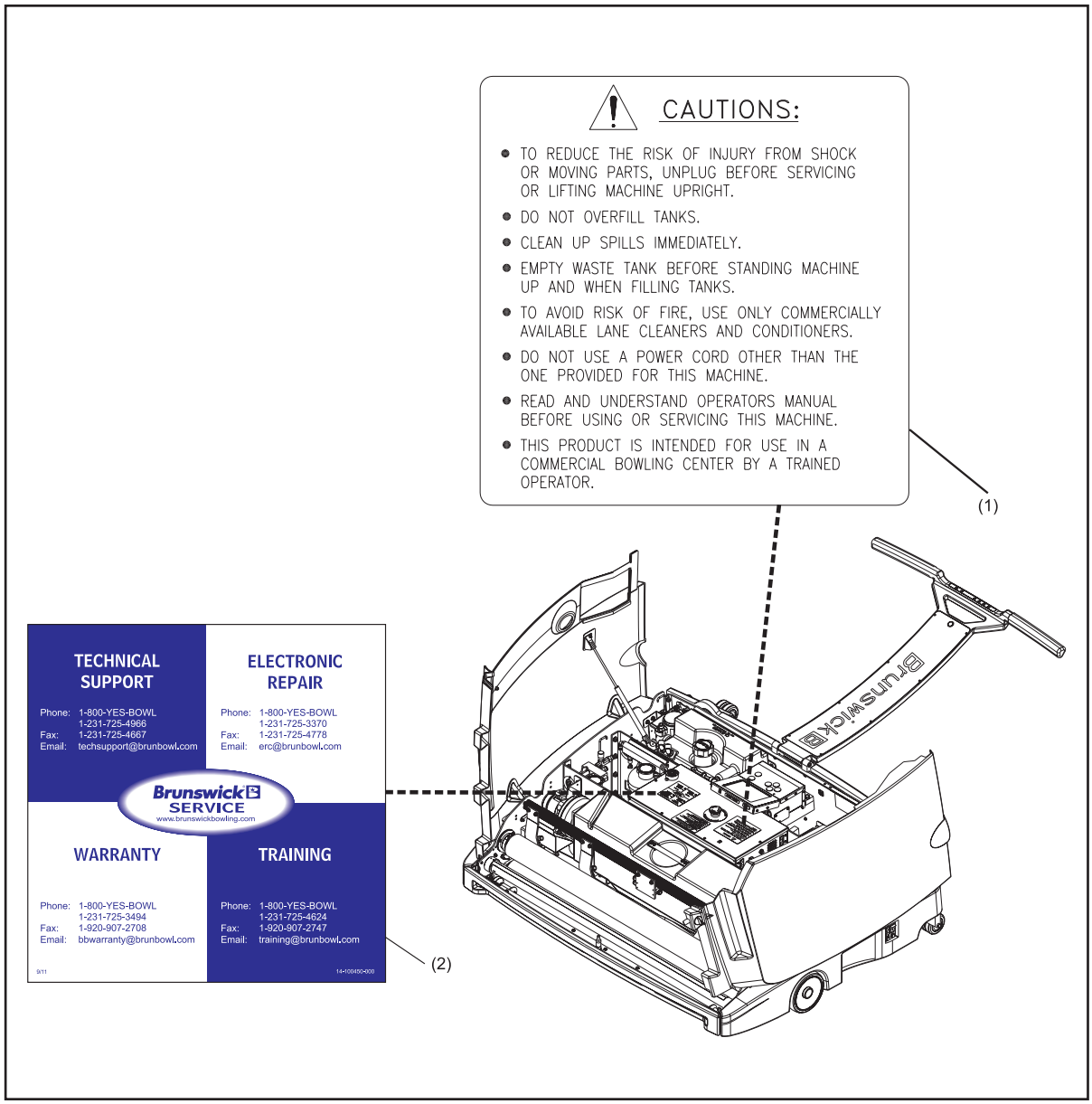


Figure 1-4. Caution & Support Decal Locations

(1) CAUTION DECAL (REORDER PART NUMBER 14-100146-000)
(2) BTS/WARRANTY CONTACT DECAL (REORDER PART NUMBER 14-100425-000)

GUI SAFETY & WARNING SCREENS

There are no user serviceable items inside the Graphical User Interface. If you need assistance, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

Section 2: Getting to Know the Envoy

Before you get started you should understand the basic parts and processes of the machine. This section gives you a general introduction to the machine, its design, and how it works. Illustrations identify important parts and systems and provide references to better understand the machine.

For purposes of orientation and reference, unless stated otherwise, when this manual refers to areas on the machine, it will be assumed the machine is in the operating position, as viewed by the operator at the foul line. Refer to Figure 2-1.

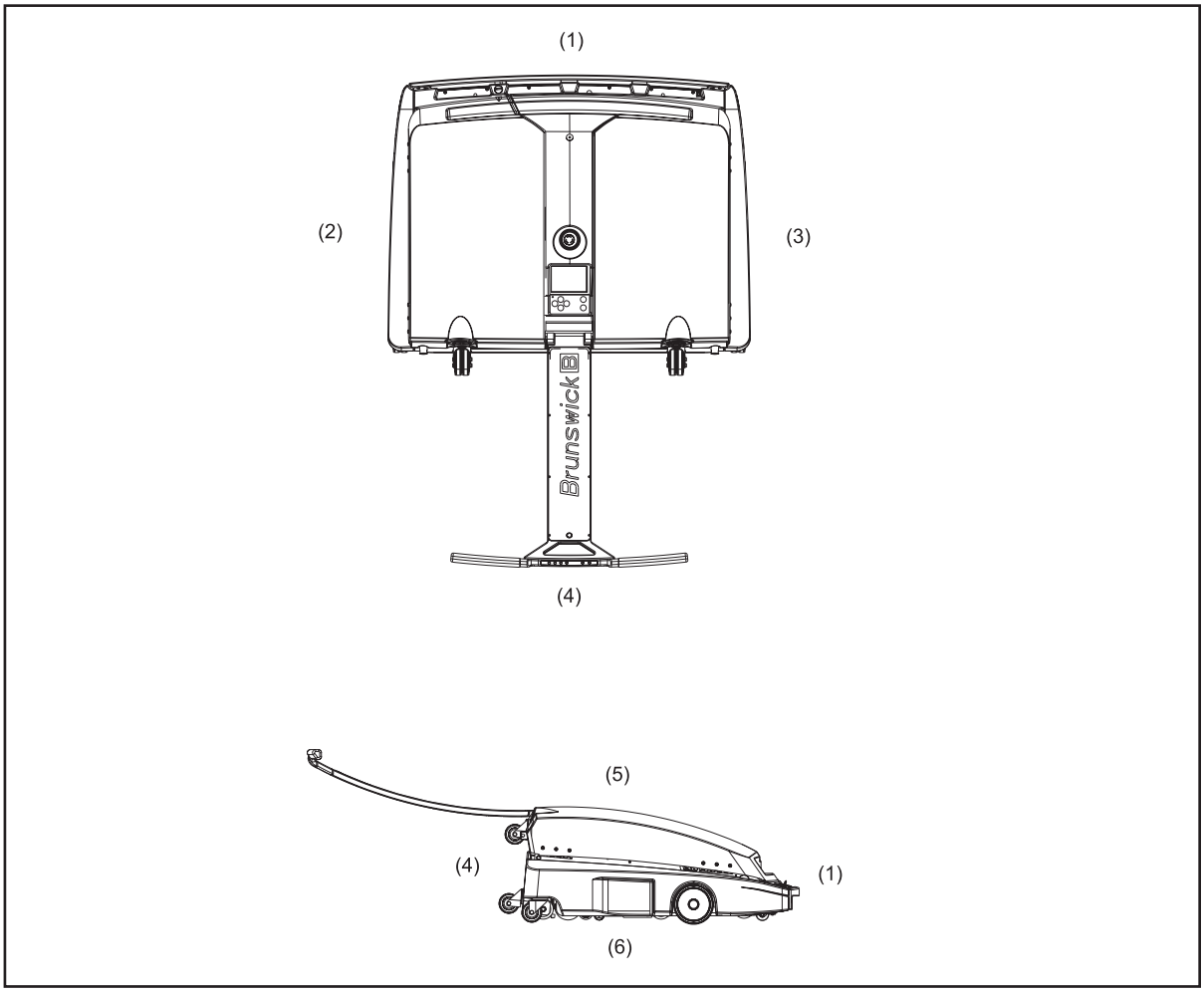


Figure 2-1. Machine Orientation

(1) FRONT
(2) 7 PIN OR LEFT SIDE
(3) 10 PIN OR RIGHT SIDE
(4) REAR
(5) TOP
(6) BOTTOM

In this section you will find:

1. Machine Specifications

2. An introduction to the machine's features

3. An overview of basic systems and operation:
   a. The cleaning system
   b. The conditioning system
   c. The buffing operation
   d. The drive system
   e. The charging system

4. A visual guide to the machine:
   a. In operating position (Top View)
   b. In transport position (Bottom View)
   c. Graphical User Interface (GUI)
   d. Handle controls

MACHINE SPECIFICATIONS

Dimensions and Weights

Refer to Figure 2-2.

Crate Dimensions: 85" x 48" x 26" (2.16m x 1.22m x .66m)
Crate, Machine, Power Cord, Charger, Spare Parts Kit: Weight: 500-600 lbs (227-272 kg)
Machine Dimensions: 57" x 45" x 18" (1.45m x 1.14m x .46m)
Machine Weight w/ Power Supply: 375 lbs. (170 kg)
Power Supply w/ Lithium Battery: 400 lbs. (181 kg)
Power Supply w/ AGM Battery: 450 lbs. (204 kg)

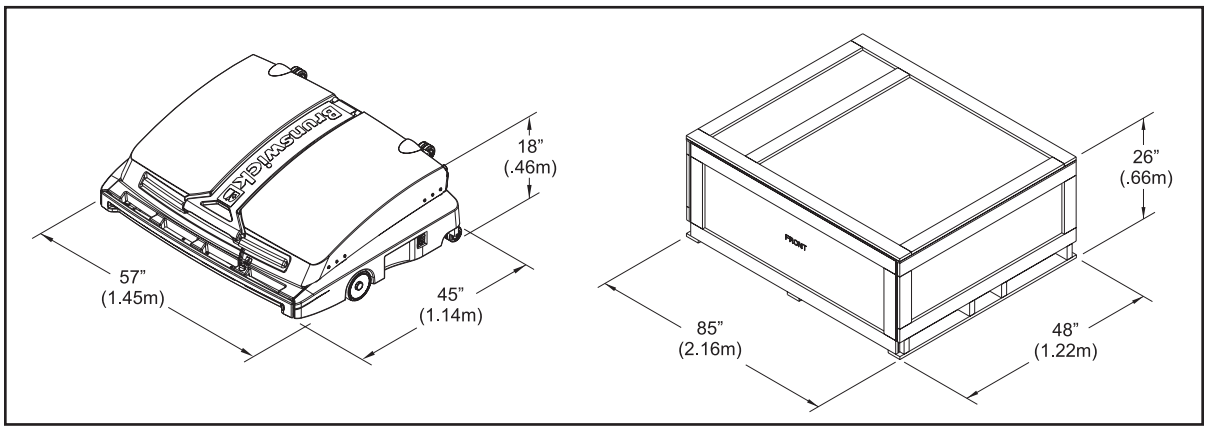


Figure 2-2. Crate & Machine Dimensions

Capacities

Cleaner Tank Capacity: 2.5 gal. = 320 fl. oz. (9.46 l = 9464 ml) up to 40 lanes
Conditioner Tank Capacity: 1.6 qt.. = 51 fl. oz. (1.51 l = 1508 ml) up to 60 lanes
Waste Tank Capacity: 2.5 gal. = 320 fl. oz. (9.46 l = 9464 ml) up to 40 lanes

MACHINE FEATURES

The Envoy is designed to make lane care easy, reliable, and customized for the needs of individual bowling centers.

1. **Direct + injector technology.** We have leveraged the technology of our Mercury Marine division to develop a patented injection system with unprecedented precision. Thirty-nine injectors (one for each board) are independently controlled to deliver precise amounts of conditioner directly to the lane surface. Oil output is measured in industry-standard "units of oil calculations."

2. **Powerful and rugged controller.** A powerful computer system monitors operations, tells you when the machine needs maintenance, and lets you customize just about every aspect of operation – from daily schedules, to cleaner patterns, to conditioner volumes and more.

3. **Intuitive Graphical User Interface (GUI)**. The graphical user interface is deliberately simple to use and understand, without extensive training or instruction. Operating procedures are logical and intuitive. The display screen and GUIs are large, easy to see, and use.

4. **Dependable Flexpower options.** The Envoy gives you the ability to choose between AGM batteries, a Lithium battery, or the AC/DC Power supply to operate the machine. The Envoy uses a smart charger system to maintain battery life and performance. Simply connect the charger cable to the charge port and supply power to the charger. The Graphical User Interface software monitors the charge and documents the charge cycle. A buzzer will alert you if the machine is not charging after use.

5. **Unparalleled customization.** The Envoy lets you design your own conditioner patterns, decide when you want to start and stop most operations, set up schedules that vary by time of day, day of the week, or set of lanes. No other machine offers as much built-in flexibility in operation.

6. **Superior pattern control.** The Envoy comes pre programmed with high-performance conditioner patterns that can be graphically displayed and easily customized. A center's existing patterns can be easily programmed in the Envoy, so you can duplicate favorite patterns without trial and error.

7. **High efficiency.** The Envoy works faster than competitors' machines—it takes just 85 seconds to clean and condition a lane at max clean speed and 65 seconds at quick clean speed. And with 25% more cleaner and recovery tank capacity than existing machines, you can complete up to 40 lanes without refilling or emptying tanks.

8. **Easy maintenance.** Many commonly replaced parts change out in half the time of similar machines.

9. **Enhanced ergonomics.** Most of the machine's basic functions can be controlled from a standing position using the handle controls. By putting common functions at the operator's fingertips, we've reduced unnecessary stooping, and bending. The EZ Steer feature makes it easy to move the machine with less effort and better control than other designs.

BASIC OPERATIONS

The Envoy performs a variety of cleaning and conditioning operations simultaneously as it travels the lane surface. When the machine is in clean and condition mode, it follows this sequence of operation:

1. Begins forward travel down the lane
2. Dusts
3. Applies cleaning solution
4. Scrubs the surface of the lane
5. Channels cleaning solution and waste to the vacuum system
6. Vacuums cleaning solution and waste into the waste recovery tank
7. Applies fresh conditioner directly to the lane surface
8. Buffs the conditioner on the lane until it reaches the pattern end distance you specify
9. Stops conditioner application
10. Programmable cleaning distance continues cleaning the lane through the end of the pin deck
11. Stops cleaning and travel
12. Reverses direction and wipes pin deck to remove excess moisture
13. Continues to buff the conditioner in the oil pattern
14. Stops buffing at programmed distance from the foul line
15. Prepares to start the next lane

The Cleaning System

The cleaning system removes dust and dirt from the lane surface, applies cleaning solution to the lane, scrubs the surface, and then removes all waste from the lane, collecting it in the waste recovery tank. The basic operation of the cleaning system is as follows:

1. The duster contact roller lowers so the duster cloth is in contact with the lane surface, removes dust and dirt from the lane surface as the machine travels toward the pin deck. Refer to Figure 2-3.

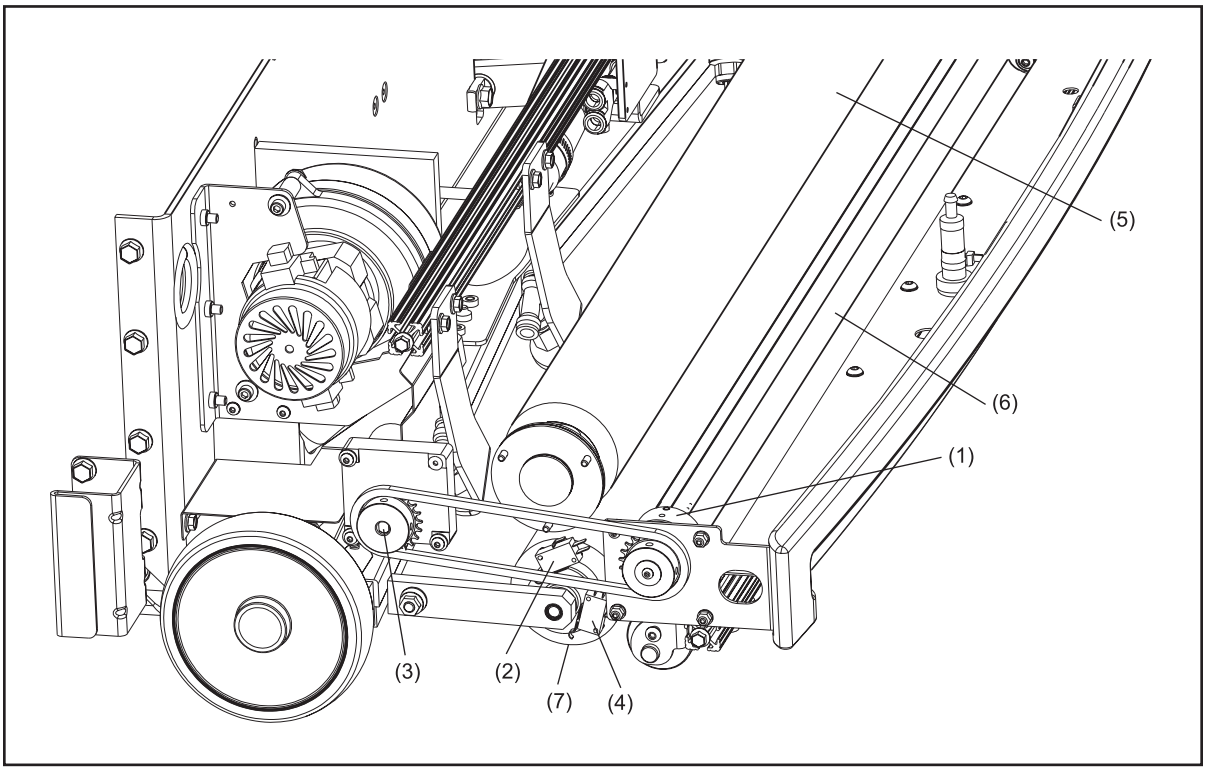


Figure 2-3. Duster Cloth System

(1) DUSTER CLUTCH
(2) DUSTER UP SWITCH
(3) DUSTER CLOTH MOTOR
(4) DUSTER DOWN SWITCH
(5) DUSTER CLOTH SUPPLY ROLL
(6) DUSTER CLOTH TAKE UP ROLL
(7) DUSTER CONTACT ROLLER

2. The **cleaner spray nozzles** apply a continuous spray of cleaning fluid to the lane. Refer to Figure 2-4.

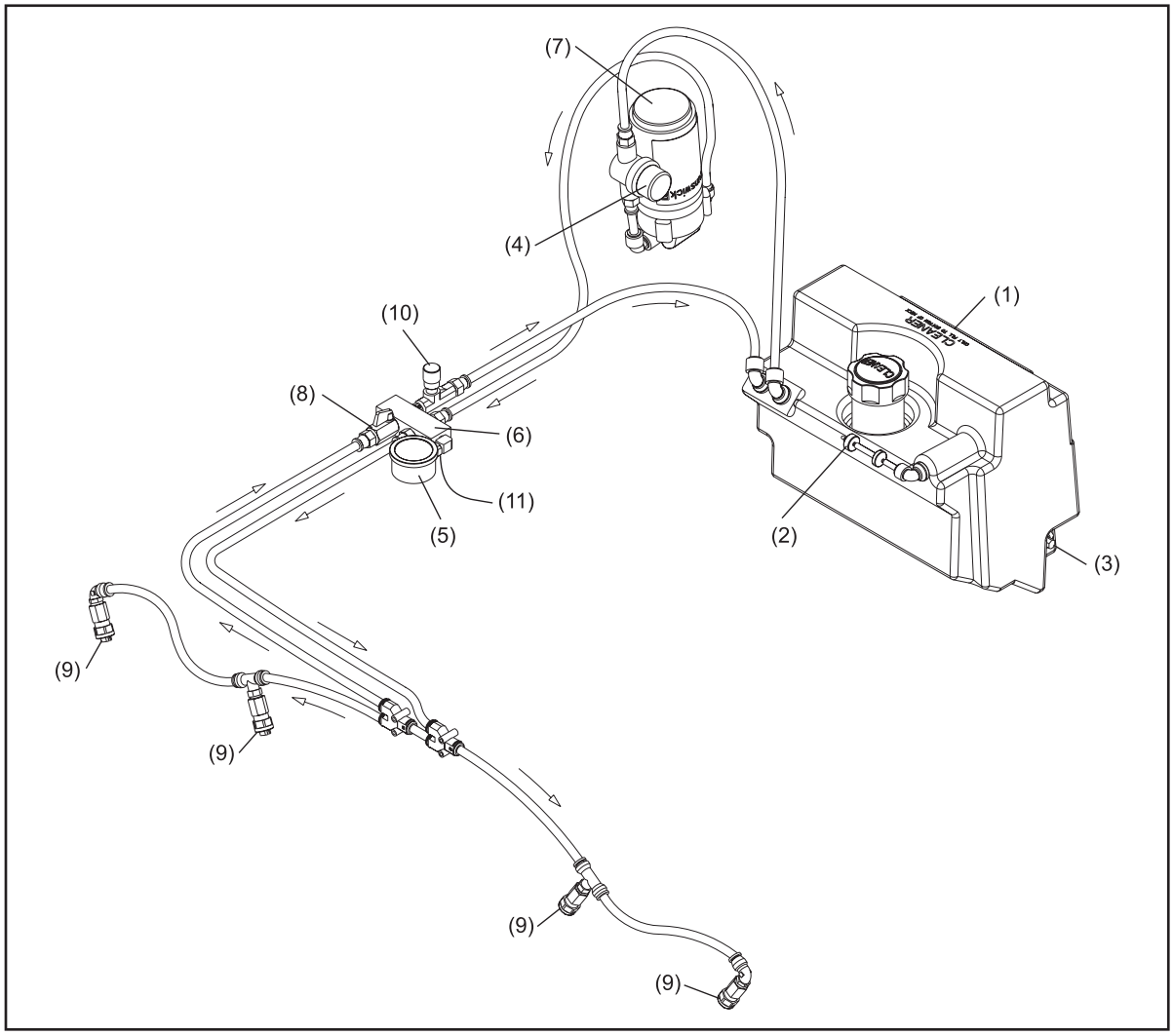


Figure 2-4. Cleaner Spray System

(1) CLEANER SUPPLY TANK
(2) CLEANER VENT VALVE
(3) CLEANER LEVEL FLOAT SENSOR
(4) CLEANER SCREEN FILTER
(5) CLEANER PRESSURE GAUGE
(6) CLEANER MANIFOLD
(7) CLEANER PUMP
(8) CLEANER SHUT OFF VALVE
(9) CLEANER SPRAY NOZZLES
(10) PRESSURE CONTROL VALVE
(11) LOW PRESSURE SWITCH

3. The **absorbent wiper** agitates the cleaning fluid on the lane to loosen dirt and old conditioner from the surface. Refer to Figure 2-5.

4. The **squeegee blade** channels waste fluid to the center of the **squeegee head assembly**. Refer to Figure 2-5.

5. All waste fluid is suctioned into the **waste recovery tank**. Refer to Figure 2-5.

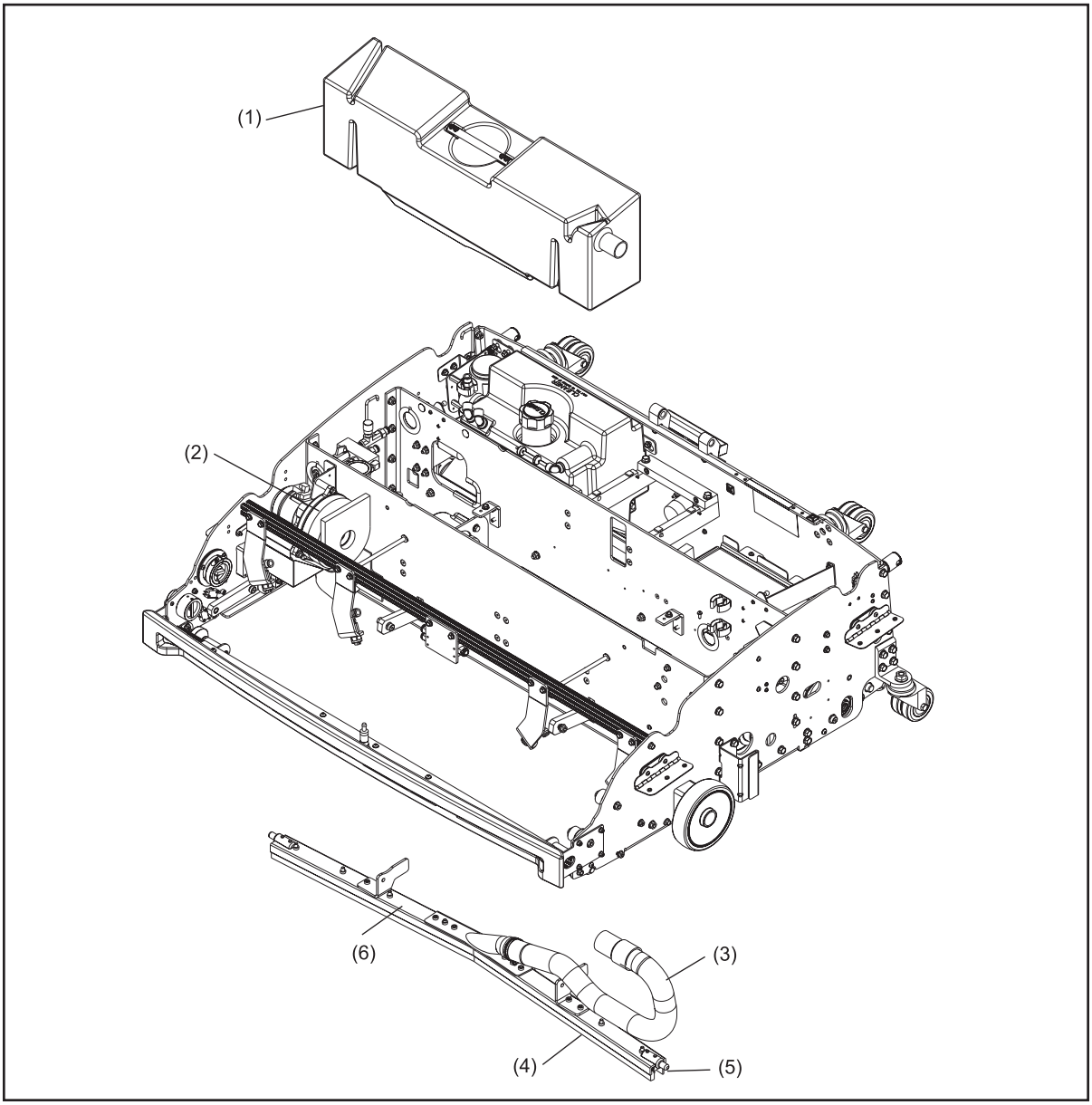


Figure 2-5. Cleaner Vacuum System

(1) WASTE RECOVERY TANK
(2) VACUUM MOTOR ASSEMBLY
(3) WASTE HOSE
(4) ABSORBENT WIPER
(5) SQUEEGEE BLADE
(6) SQUEEGEE HEAD ASSEMBLY

6. When the machine reaches the end of the lane, the duster cloth and squeegee assembly raise for the return travel to the approach .

7. The duster cloth take-up roller continues to rotate to advance new duster cloth for use on the next lane. Refer back to Figure 2-3.

The Direct + Conditioning System

The conditioning system is a highly advanced, computer controlled, direct-application system that applies conditioner to the lane surface in any pattern specified by the bowling center. Here's how it works:

1. 39 conditioner injectors mounted on a pressurized injector rail assembly apply conditioner to the lane surface according to the selected pattern. Refer to Figure 2-6.

2. Conditioner injectors are individually controlled to disperse conditioner the width of one board, in pulses every 1.2 inches along the length of the lane surface, allowing precise application and volume control.

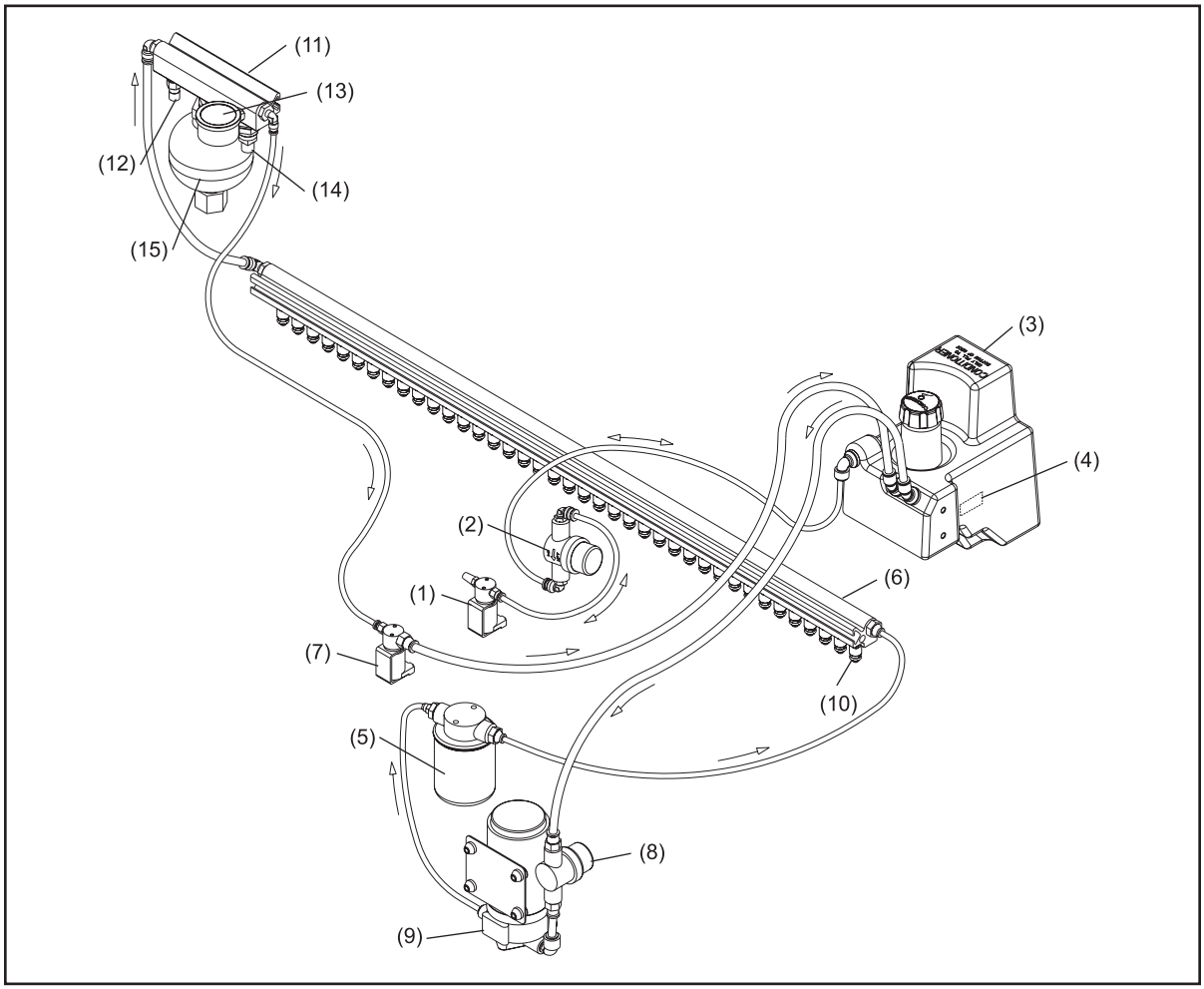


Figure 2-6. Conditioning System

(1) CONDITIONER VENT VALVE
(2) CONDITIONER OVERFLOW RESERVOIR
(3) CONDITIONER SUPPLY TANK
(4) CONDITIONER LEVEL FLOAT SENSOR
(5) CONDITIONER SPIN-ON FILTER
(6) INJECTOR RAIL ASSEMBLY
(7) CONDITIONER PRESSURE CONTROL VALVE
(8) CONDITIONER SCREEN FILTER
(9) CONDITIONER PUMP
(10) CONDITIONER INJECTOR
(11) ACCUMULATOR RAIL
(12) CONDITIONER TEMPERATURE SENSOR
(13) CONDITIONER PRESSURE GAUGE
(14) CONDITIONER PRESSURE SENSOR
(15) ACCUMULATOR

NOTE: *For more information on designing or selecting conditioning patterns, see* ***The Pattern Screen*** *section in "Section 5: Using the Graphical User Interface" and "Section 8: Pattern Design Theory."*

The Buffing Operation

The buffing operation blends the conditioner on the lane surface.

1. The buffer lifting motor lowers the buffer brush to the lane surface and the buffer drive motor rotates the buffer brush in the direction of forward machine travel (clockwise, when viewed from the right side of the brush assembly) blending the injected conditioner lengthwise on the surface of the lane. Refer to Figure 2-7.

2. The dispersion roller rotates in the same direction of the buffer brush, contacting only the buffer brush and blending the conditioner amongst the bristles through side-to-side oscillation. Refer to Figure 2-7.

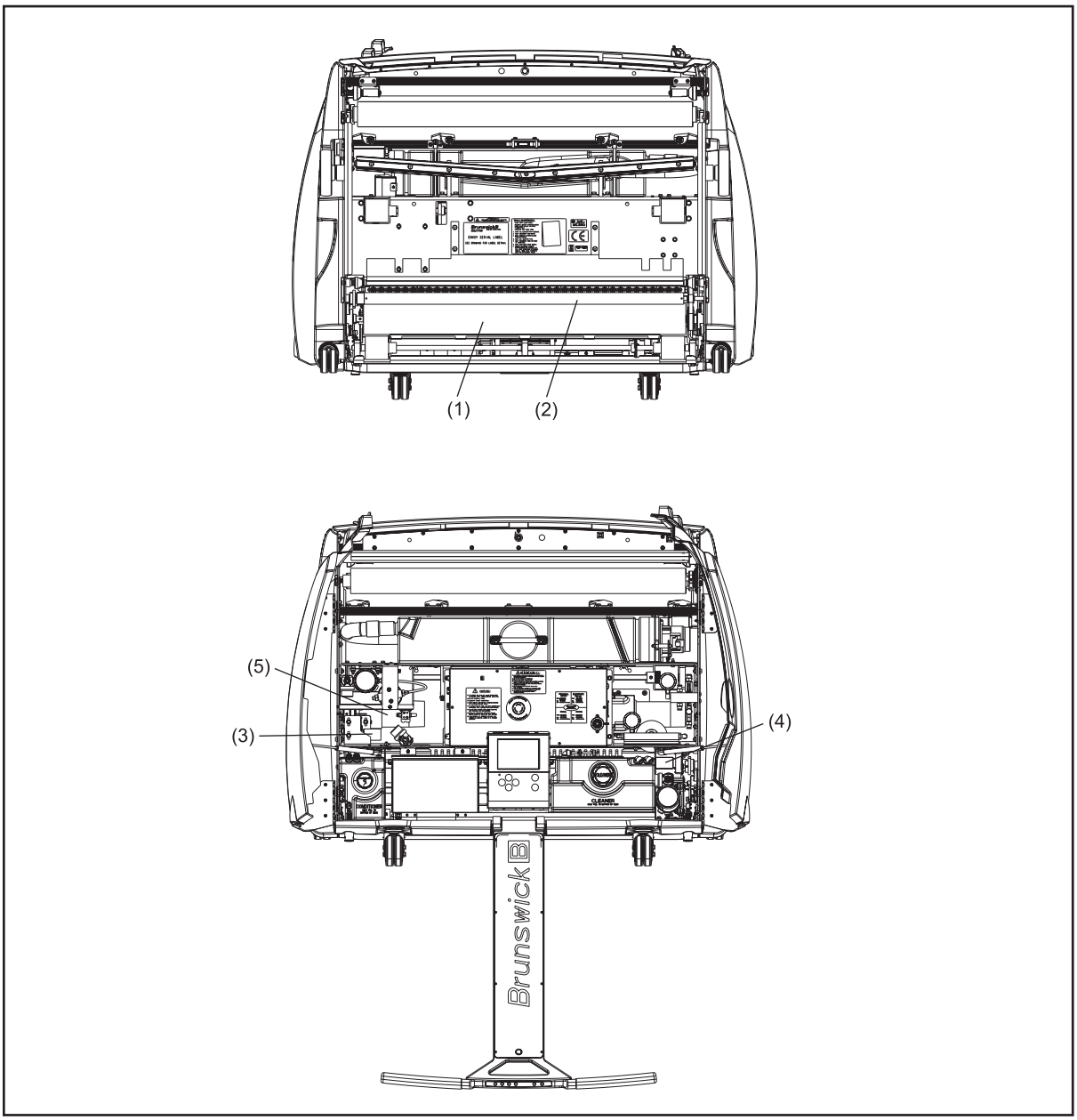


Figure 2-7. Buffing System

(1) BUFFER BRUSH
(2) DISPERSION ROLLER
(3) BUFFER LIFTING MOTOR
(4) DISPERSION ROLLER MOTOR
(5) BUFFER DRIVE MOTOR

3. When the machine reaches the end of the conditioning pattern, the buffer brush and dispersion roller stop rotating and the buffer brush is raised up and out of contact with the lane surface until the machine reaches the pin deck.

4. When the machine returns from the end of the lane to the conditioner pattern section of the lane, the buffer brush will lower back to the lane surface if conditioner values are programmed in last zone. (If last zone conditioner values equals zero, the last zone is skipped and the buffer brush lowers at the next to last zone.) The buffer brush will continue blending the conditioner until the machine reaches the programmed distance from the foul line.

5. The buffer lifting motor will raise the buffer brush and the brush will stop turning. The machine will continue traveling back to the foul line and stop.

The Traction Drive System

The traction drive system moves the machine forward and in reverse as it cleans and conditions. Sensors detect the machine's travel and position on the lane and send signals to the controller, which activates and deactivates other operations based on the machine's position on the lane.

1. The traction drive motor turns a chain which rotates the traction wheel drive shaft. The traction drive wheels contact the lane surface and as the traction wheel drive shaft turns, the machine begins to move down the lane towards the pin deck. Refer to Figure 2-8.

2. The rear shaft turns as the machine begins to move down the lane. The distance encoder starts counting the distance on the forward and reverse travel.

3. When the end of lane sensor travels past the end of the pin deck, the machine travels an additional 1.2 feet, so the cleaning system can clear the pin deck, and then the controller turns off the motor.

4. The traction drive motor turns on and the machine returns to the foul line at the same rate of speed as it moved in forward travel.

5. As the machine nears the foul line, the controller turns off the traction drive motor and it stops at the foul line.

6. Once the machine stops at the foul line, the GUI displays the number of the next lane to be maintained.

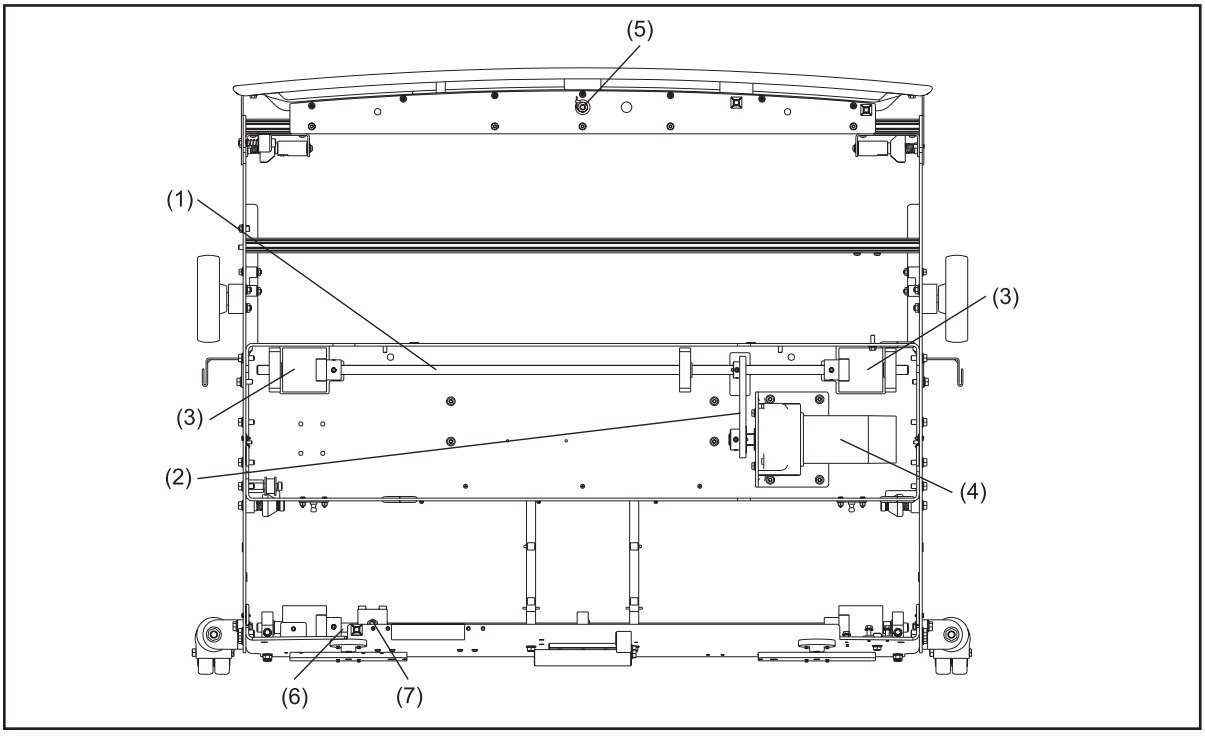


Figure 2-8. Traction Drive System

(1) TRACTION WHEEL DRIVE SHAFT
(2) TRACTION MOTOR CHAIN
(3) TRACTION DRIVE WHEELS
(4) TRACTION DRIVE MOTOR
(5) END OF LANE SENSOR
(6) REAR SHAFT
(7) DISTANCE ENCODER

The Charging System

Envoy power options

1. The Envoy lane machine can be shipped with any configuration of three power sources.

   a. The Absorbed Glass Matt (AGM) batteries (2ea)

   b. The Lithium battery

   c. The optional AC/DC Power Supply

2. A grounded power supply (100-240 VAC, 50//60 Hz outlet) must be used to protect the operator from electric shock.

3. Figures 2-9 and 2-10 show these components in configurations with both types of batteries

4. Each power “source” (AGM battery, Lithium battery or AC/DC power supply) has its own unique Power Jumper that is attached to their power cables near the plug. The correct Power Type jumper needs to be connected to the electrical enclosure to indicate the proper operating conditions for that power source. For more information on the power system and batteries refer to Section 3, “Understanding Your Envoy Power System”.

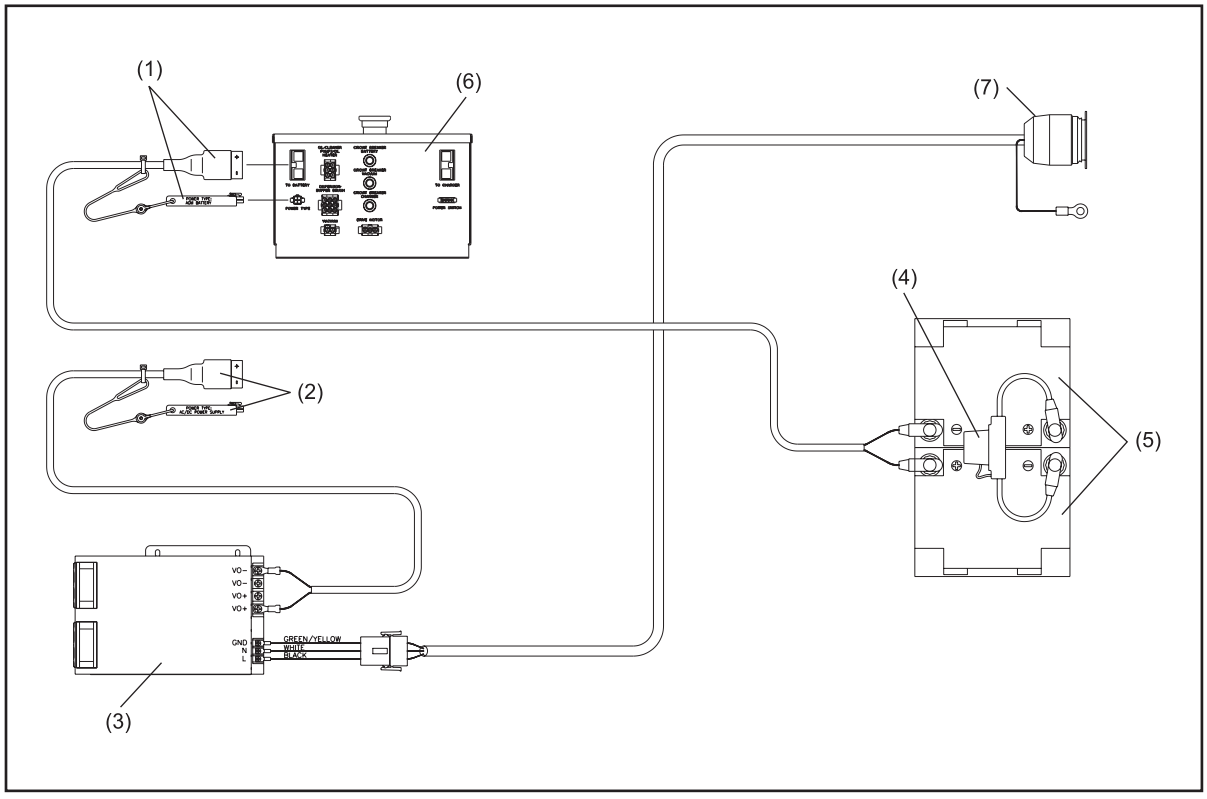


Figure 2-9. AGM Battery Configuration

(1) AGM BATTERY POWER CABLE AND JUMPER
(2) AC/DC POWER CABLE AND JUMPER
(3) AC/DC POWER SUPPLY
(4) 40A MAXI FUSE
(5) AGM BATTERIES
(6) ELECTRONIC ENCLOSURE
(7) TWIST LOCK ON REAR COVER

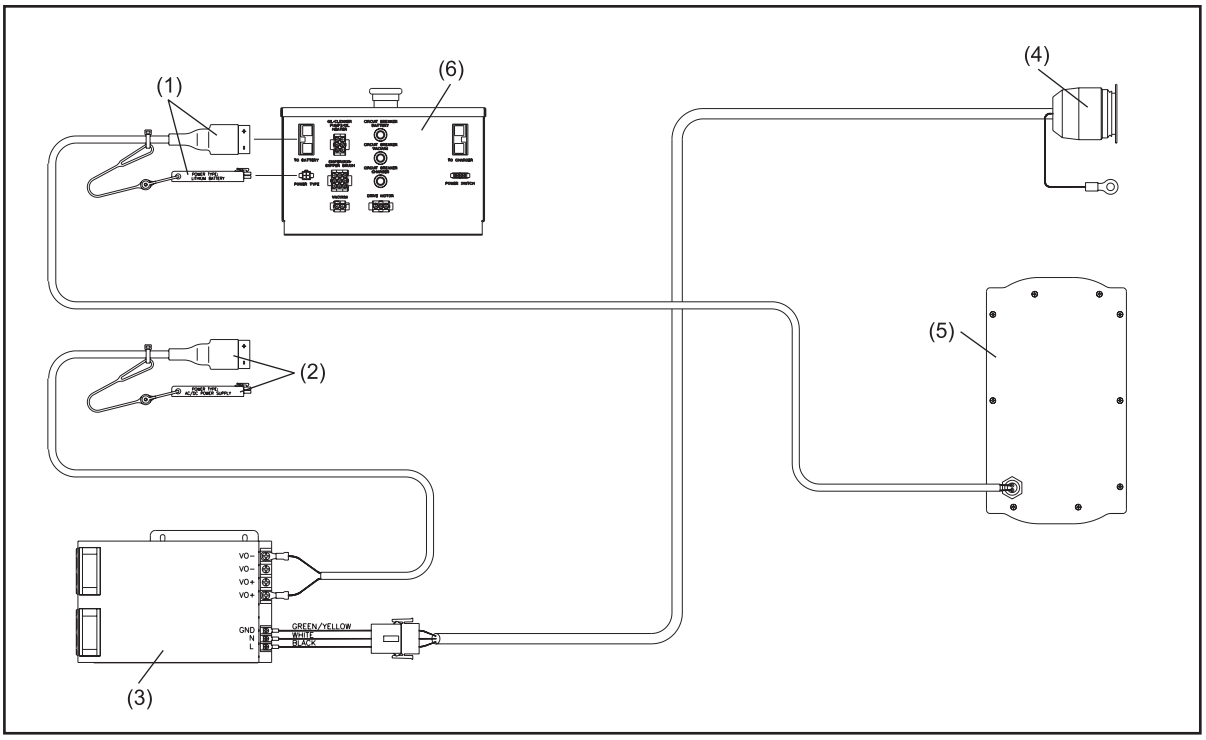


Figure 2-10. Lithium Battery Configuration

(1) LITHIUM BATTERY POWER CABLE AND JUMPER
(2) AC/DC POWER CABLE AND JUMPER
(3) AC/DC POWER SUPPLY
(4) TWIST LOCK ON REAR COVER
(5) LITHIUM BATTERY
(6) ELECTRONIC ENCLOSURE

FINDING YOUR WAY AROUND THE ENVOY

This section gives you an illustrated "tour" of the machine to help you locate important components and systems.

Operating Position

Most maintenance operations are made with the machine in "operating position" with the covers open. Refer to Figure 2-11.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

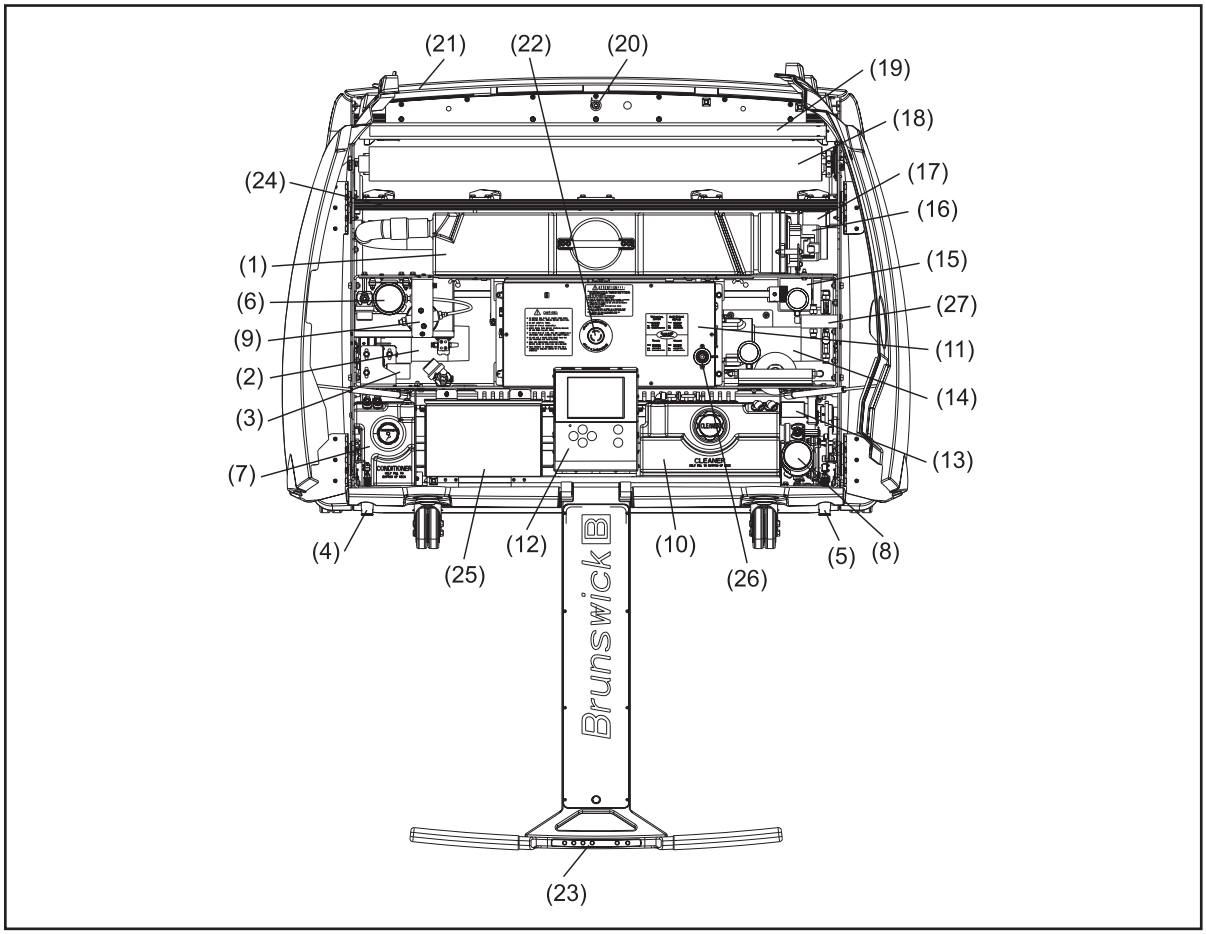


Figure 2-11. Operating Position

(1) WASTE RECOVERY TANK
(2) BUFFER DRIVE MOTOR
(3) BUFFER LIFTING MOTOR
(4) LEFT CORD KILL ASSEMBLY
(5) RIGHT CORD KILL ASSEMBLY
(6) CONDITIONER PUMP
(7) CONDITIONER SUPPLY TANK
(8) CLEANER PUMP
(9) CONDITIONER SPIN-ON
(10) CLEANER SUPPLY TANK
(11) ELECTRONICS ENCLOSURE
(12) GRAPHICAL USER INTERFACE (GUI)
(13) DISPERSION ROLLER MOTOR
(14) TRACTION DRIVE MOTOR
(15) TRACTION WHEELS
(16) VACUUM MOTOR ASSEMBLY
(17) DUSTER CLOTH MOTOR
(18) DUSTER CLOTH SUPPLY ROLL
(19) DUSTER CLOTH TAKE UP ROLL
(20) END-OF-LANE SENSOR
(21) FRONT HANDLE/BUMPER
(22) EMERGENCY SHUT OFF SWITCH
(23) HANDLE KEYPAD
(24) CLEANER RAIL ASSEMBLY
(25) BATTERY
(26) WARNING BEEPER
(27) CLEANER MANIFOLD

Transport Position

Some maintenance procedures are performed with the machine in “transport position,” with the machine upright, its underside exposed, and resting on its transport casters. Refer to Figure 2-12.

WARNING! Always unplug AC power cord from the machine before servicing or lifting machine into transport position. Never supply AC power to machine when it is in transport position. Note: It is OK to connect DC power from battery charger in transport position.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

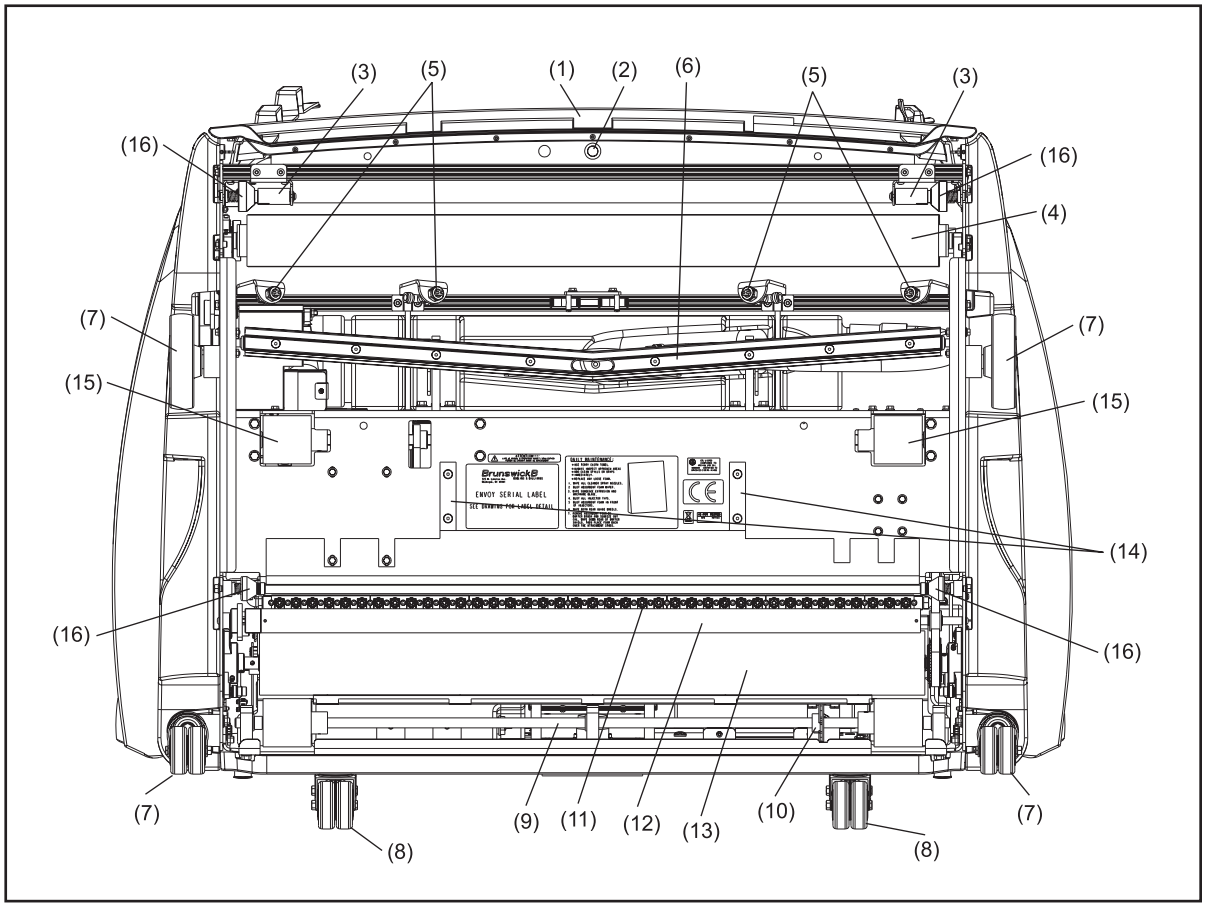


Figure 2-12. Transport Position

(1) FRONT HANDLE/BUMPER
(2) END-OF-LANE SENSOR
(3) TRANSITION ROLLERS
(4) DUSTER CONTACT ROLLER
(5) CLEANER SPRAY NOZZLES
(6) VACUUM SQUEEGEE HEAD
(7) LANE TO LANE WHEELS
(8) TRANSPORT CASTERS ASSEMBLY
(9) REAR SHAFT ASSEMBLY
(10) DISTANCE ENCODER
(11) CONDITIONER INJECTORS
(12) DISPERSION ROLLER
(13) BUFFER BRUSH
(14) SKID PLATES
(15) TRACTION DRIVE WHEELS
(16) GUIDE ROLLERS

The Graphical User Interface (GUI)

The GUI lets you monitor the machine's operation while you use it. It also alerts you to maintenance needs, tells you about past service records, gives access to conditioning programs, and much more. Refer to Figure 2-13.

NOTE: For detailed information on using the GUI, see ***Section 4: Graphical User Interface.***

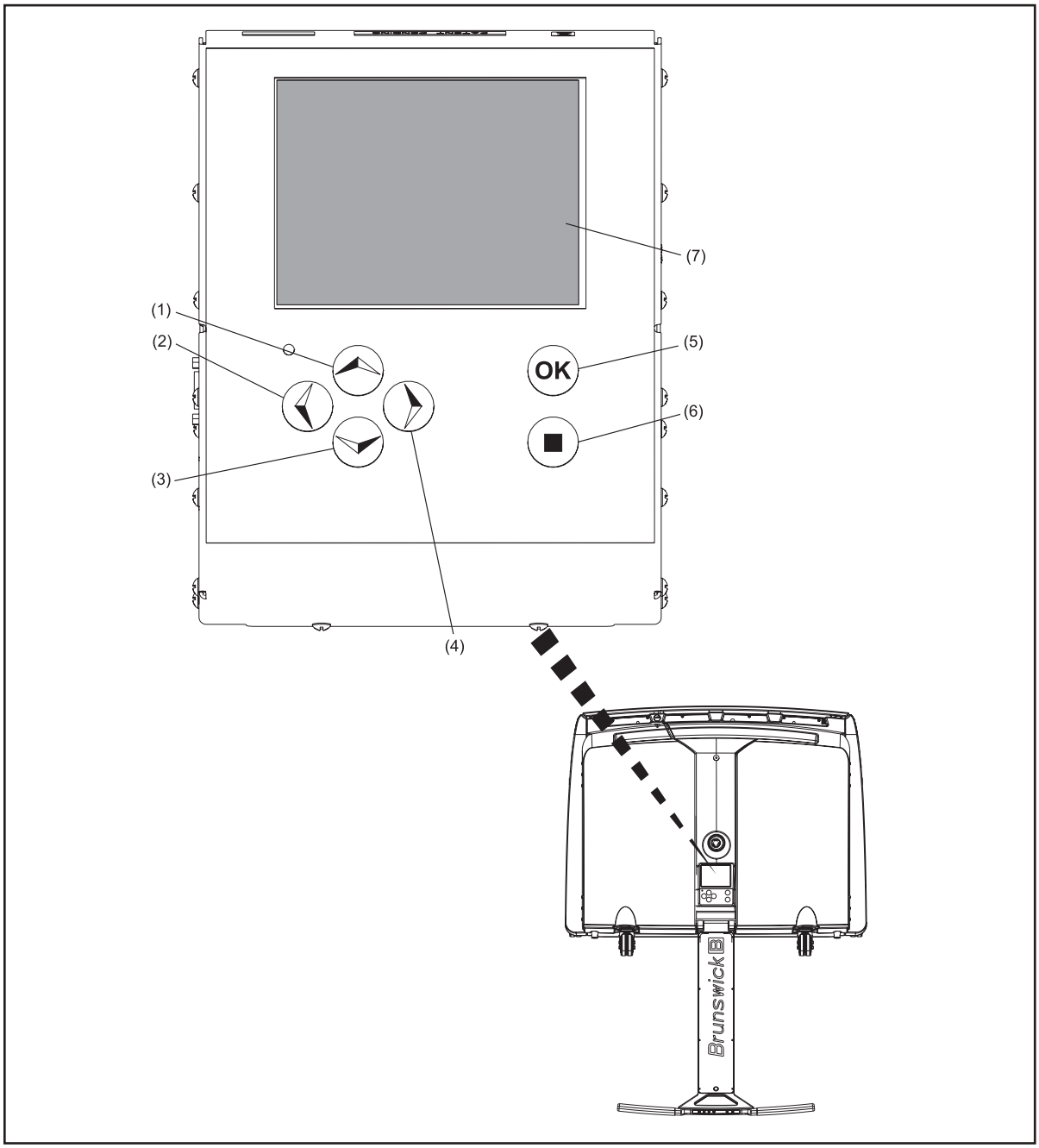


Figure 2-13. Graphical User Interface (GUI)

(1) UP ARROW BUTTON
(2) LEFT ARROW BUTTON
(3) DOWN ARROW BUTTON
(4) RIGHT ARROW BUTTON
(5) OK BUTTON
(6) EXIT BUTTON
(7) DISPLAY SCREEN

Handle Controls

All of the machine's operations can be controlled using the control pad on the machine's handle. By putting the machine functions on the handle, we reduce stooping, kneeling and bending and allow more healthful operation of the machine. Refer to Figure 2-14.

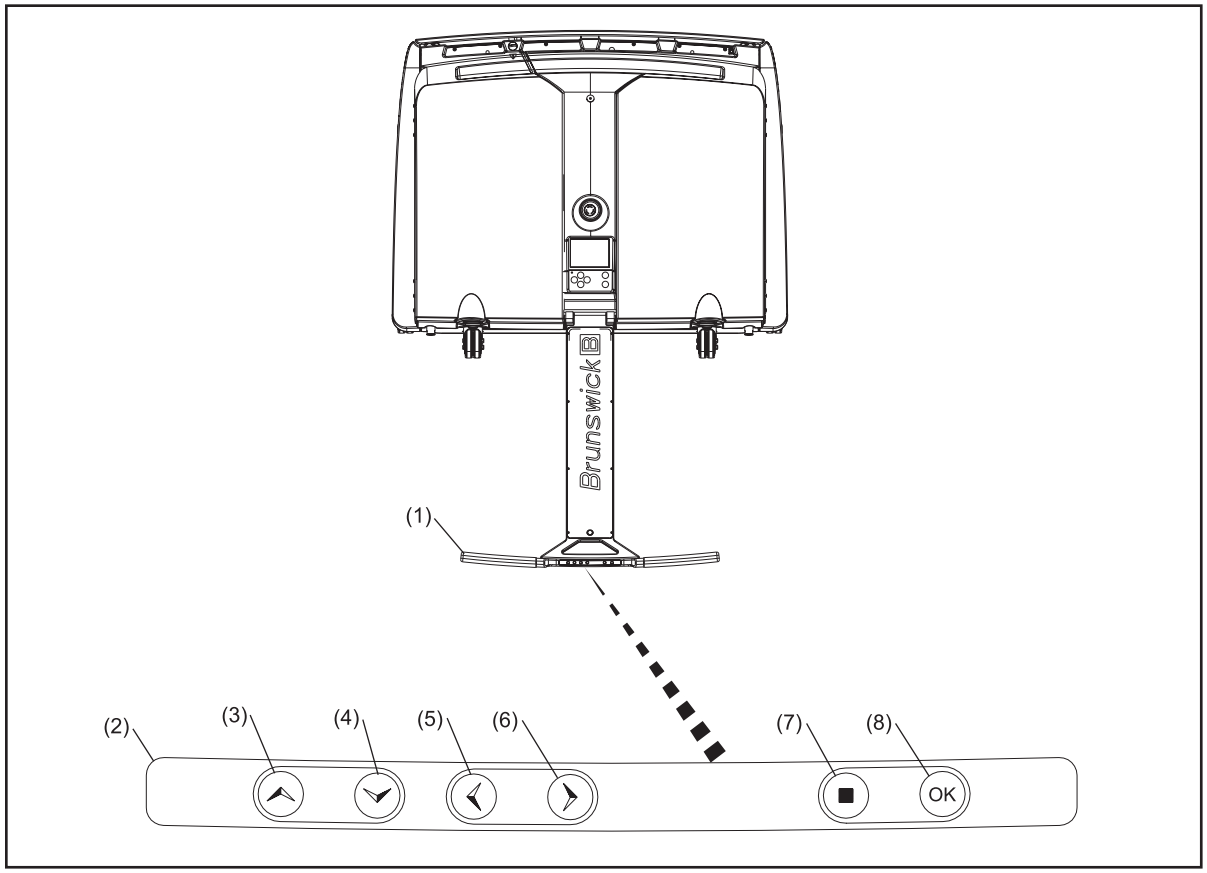


Figure 2-14. Handle Controls

(1) OPERATOR HANDLE
(2) HANDLE KEYPAD
(3) UP ARROW BUTTON
(4) DOWN ARROW BUTTON
(5) LEFT ARROW BUTTON
(6) RIGHT ARROW BUTTON
(7) EXIT BUTTON
(8) OK BUTTON

Section 3: Envoy Power System

The Envoy can be operated from three different power options. Depending on your purchase options, you will have one or more of these in your machine.

1. Absorbed Glass Matt (AGM) Batteries (2 ea.)
2. Lithium Battery (1 ea.)
3. AC/DC Power Supply (1 ea.)

AGM BATTERIES

The 12 volt AGM batteries have a two year shelf life. They are spill proof and can be operated in any position except with the terminals upside-down. There are two, 12 volt AGM batteries connected in series with a 40A MAXI fuse for protection. The power cable of the AGM battery should be connected to the electrical enclosure along with the Power Type jumper for the AGM battery. This battery configuration is capable of running 32 lanes per full charge. They are capable of 400 charge/discharge cycles to a depth of 80% discharged. This is equal to running 32 lanes per charge once a day for 400 days, or just over one year. A smaller center would discharge the batteries less per run and thereby get more charge/discharge cycles. For example, a 16 lane center would only discharge the batteries by 40% per run and would be expected to get approximately 800 charge/discharge cycles or over two years of usage.

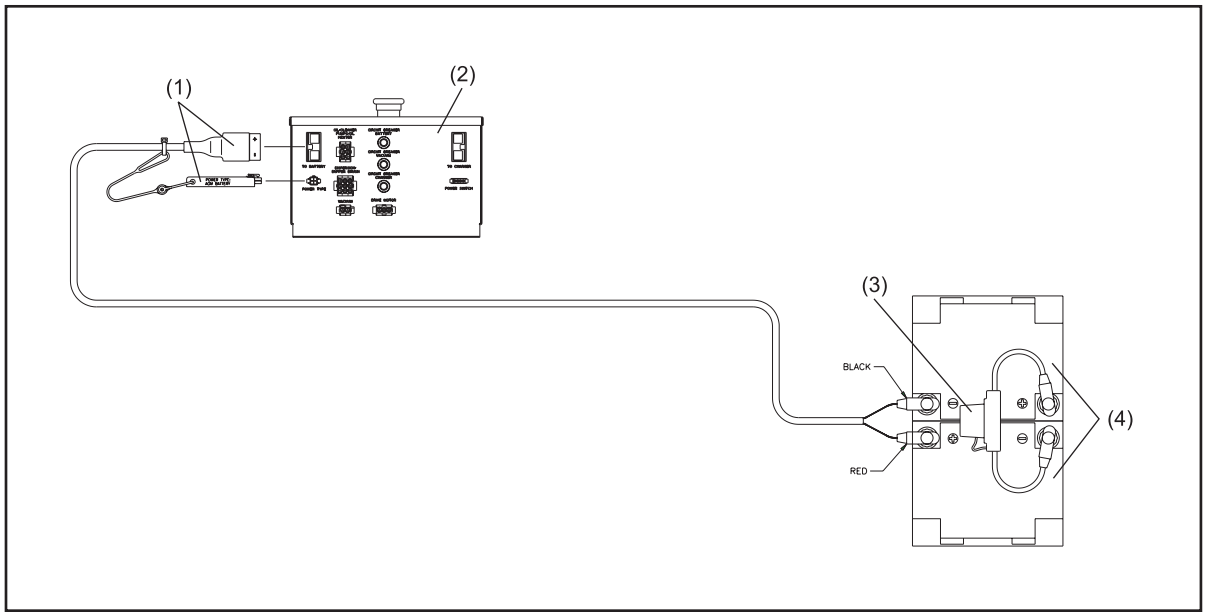


Figure 3-1. AGM Batteries

(1) AGM POWER CABLE AND JUMPER
(2) ELECTRONIC ENCLOSURE
(3) 40A MAXI FUSE
(4) AGM BATTERIES

LITHIUM BATTERY

The 24 volt Lithium battery has a 2 year shelf life. This is a single, custom, 24 volt Lithium battery with an internal battery management system to balance and protect the cells. The power cable of the Lithium battery should be connected to the electrical enclosure along with the Power Type jumper for the Lithium battery. The Lithium battery is capable of running 60 lanes per charge, and is expected to achieve 1460 charge/discharge cycles. This is equal to running 60 lanes per charge, once a day for 4 years or twice a day for 2 years.

AC/DC POWER SUPPLY

The optional AC/DC power supply is designed to provide a level of back up protection in the event that the batteries fail to get recharged after use, or hold a charge as they end their life cycle. When purchased, the Envoy AC/DC Power Supply is installed below the electrical enclosure before the lane machine is shipped. To switch to using the AC/DC Power Supply, first disconnect the AGM or Lithium Battery power cable and power type jumper from the electrical enclosure. Then locate the AC/DC Power Supply red 24DVC power cable connector (usually coiled just under the left side of the electrical enclosure). Connect the AC/DC Power Supply cable and power type jumper to the electrical enclosure.

The input cable of the AC/DC Power Supply is already connected to the Twist-Lock connector on the rear cover. Connect the Twist-Lock end of the supplied 125' power cord into the matching connector in the rear cover. Place the power cord ring into the Cord Kill assembly. Connect the other end of the 125' cable into a grounded power supply with 100-240VAC, 50/60 Hz. The Envoy machine should now be powered by the 24VDC nominal output of the AC/DC Power Supply and operate similarly as if it were powered by a battery. The operator will now need to manage the power cord so that it does not get trapped under the lane machine during operation.

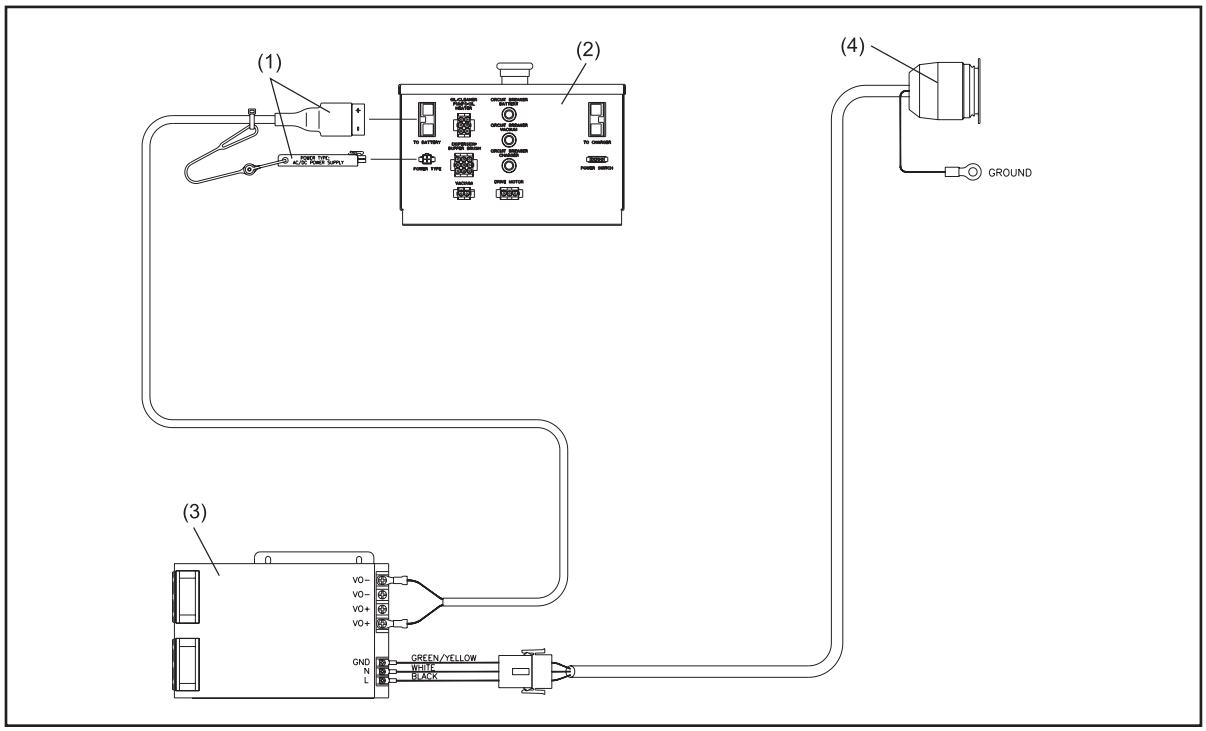


Figure 3-2. Lithium Battery

(1) AGM POWER CABLE AND JUMPER
(2) ELECTRONIC ENCLOSURE
(3) AC/DC POWER SUPPLY
(4) TWIST LOCK ON REAR COVER

The 125’ power cord should only be connected to the AC/DC Twist-Lock connector on the rear cover when the Envoy is in the operating position. This cord should be disconnected before the machine is lifted into the transport position. If the batteries are not fully charged, the AC/DC Power Supply cable and power type jumper should be disconnected from the electrical enclosure after running the lanes and the battery power cable and power type jumper should be reconnected to the electrical enclosure. The battery charger should then be connected as explained in the following section.

BATTERY CHARGER

The ProNautic 2420P charger is supplied with the proper 115/230VAC input power cord and 24VDC output power cord already attached. The charger should also be preset for the type of battery included in your Envoy lane machine. AGM should be preset to the AGM preset Profile #1 and the Lithium battery should be preset to the LiFePO4 preset Profile #1. Call Brunswick Technical Service or your installing distributor if your charger is not set to these proper settings for the type of battery in your Envoy.

It is best to install the charger onto a wall within 8’ (2.438 m) of a power outlet that is not being used to power other equipment. The AC power cord has an in-line On/Off power switch to allow you to turn the power off BEFORE disconnecting or reconnecting the DC output cable from the LH charge port of the Envoy. The DC output cable should then be reconnected to the LH charge port of the Envoy BEFORE turning the AC power back on to the charger. This sequence assures that the charger always starts with the proper mode necessary for the state of battery discharge.

CHARGING SYSTEM

The Envoy operating system is intended to have the power remain ON at all times in order to monitor the operation and charging of the batteries. A power switch and two indicator lights are located on the left hand side cover to display proper operation (See figure on next page). The Green “Power” LED should be ON to indicate that it is ready for operation or charging. The most common causes for Green ‘POWER’ LED being OFF include:

- Emergency Stop switch being depressed – Twist to pop up/ON
- Power Switch (on LH Side Cover) being OFF – Press switch to ON
- Battery Cable being disconnected from Electrical Enclosure – Open top cover to reconnect

The Red ‘CHARGE’ LED located on the LH side cover of the Envoy, should turn ON only after it senses voltage from a properly connected battery charger. This indicates the START of the battery charging process. The Red ‘CHARGE’ LED does not turn off if the charger is disconnected. This Red ‘CHARGE’ LED remains ON until the lane machine prepares to run a lane or the Power is turned off. The Red ‘CHARGE’ LED should then turn ON again after it senses voltage from a properly connected battery charger. Refer to Figure 3-3.

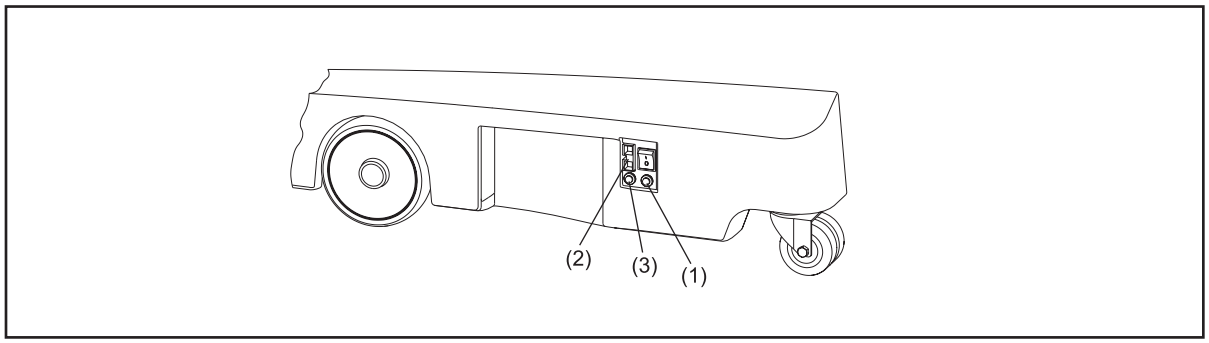


Figure 3-3. Battery Charger Connections

(1) GREEN POWER LED MUST BE ON TO CHARGE AND MONITOR BATTERIES

(2) CONNECT RED CHARGER CONNECTOR TO PORT ON LEFT HAND SIDE COVER

(3) RED CHARGER LED TURNS ON TO INDICATE START OF CHARGING BATTERY

Remember, always connect battery charger to Envoy lane machine when not running lanes:

- The Envoy green 'POWER' LED must be on to charge the batteries
- Connect the RED Charger Connection to the port on the LH cover BEFORE plugging the battery charger into the proper AC input power
- The Envoy red 'CHARGE' LED should turn ON only after it senses voltage from a properly connected battery charger. This indicates the START of the battery charging process.
- The battery charger is designed to remain connected to the battery charger whenever not running the lane machine. It will keep the batteries in optimal condition and will not overcharge them.
- Leaving the lane machine on for any extended time without connecting the battery charger will slowly discharge the batteries and reduce their capacity.

Make sure that the battery charger is positioned so it has adequate clearance to allow air circulation by the cooling fan. Disconnect the AC Input Power before disconnecting the DC Output. Detailed operating instructions are supplied with the battery charger.

NOTE: Always properly recycle your batteries by returning to an authorized recycling center or automotive dealer.

WARNING! Never use any batteries, other than the type supplied with the machine or other options authorized by Brunswick. Mixing battery types or using batteries that are different from what is supplied with the machine may damage the machine and cause serious injury or death to the operator. Use of alternate batteries, power supplies or chargers will void the machine warranty.

Charging the AGM Battery

The charger will initially provide a constant current of ~20 amps in the Charging mode as the battery voltage steadily increases near 29 volts. Then the charger automatically switches to the Conditioning mode, where it holds the constant voltage near 29 volts for the proper time as the charging current steadily decreases. The charger then switches to the Ready mode and the voltage drops to the 27 volt float level. The charger may remain in the Conditioning mode for up to 6 hours depending on the depth of the previous discharge. The Envoy electronics will continue to draw ~1 amp when inactive to power the electronic enclosure and GUI while the systems are monitoring the charging. The batteries are 95% charged if the charger amperage display is 2-3 amps even if the charger is still in the Conditioning mode. You may turn the charger power off and disconnect the DC output cable from the Envoy if you occasionally need to run the machine before the charger switches to the Ready mode.

Charging the Lithium Battery

The charger will initially provide a constant current of ~20 amps in the Charging mode as the battery voltage steadily increases near 29.9 volts. Then the charger automatically switches to the Conditioning mode, where it holds the constant voltage near 29.9 volts for the proper time as the charging current steadily decreases. The charger then switches to the Ready mode and the voltage drops to the 29.1 volt float level. The charger may remain in the Conditioning mode for up to 8 hours depending on the depth of the previous discharge. The Envoy electronics will continue to draw ~1 amp when inactive to power the electronic enclosure and GUI while the systems are monitoring the charging. The batteries are 95% charged if the charger amperage display is 2-3 amps even if the charger is still in the Conditioning mode. You may turn the charger power off and disconnect the DC output cable from the Envoy if you occasionally need to run the machine before the charger switches to the Ready mode.

BATTERY WARNINGS

There are several ways that your Envoy will communicate if there are issues with the batteries or the charging system. You will see visual warnings on the GUI and hear audible warnings from a voltage monitoring beeper.

Operator's Screen

On the Operator's screen, the background color of the battery voltage box on the operator screen will warn if the voltage is out of the expected range for that type of battery.

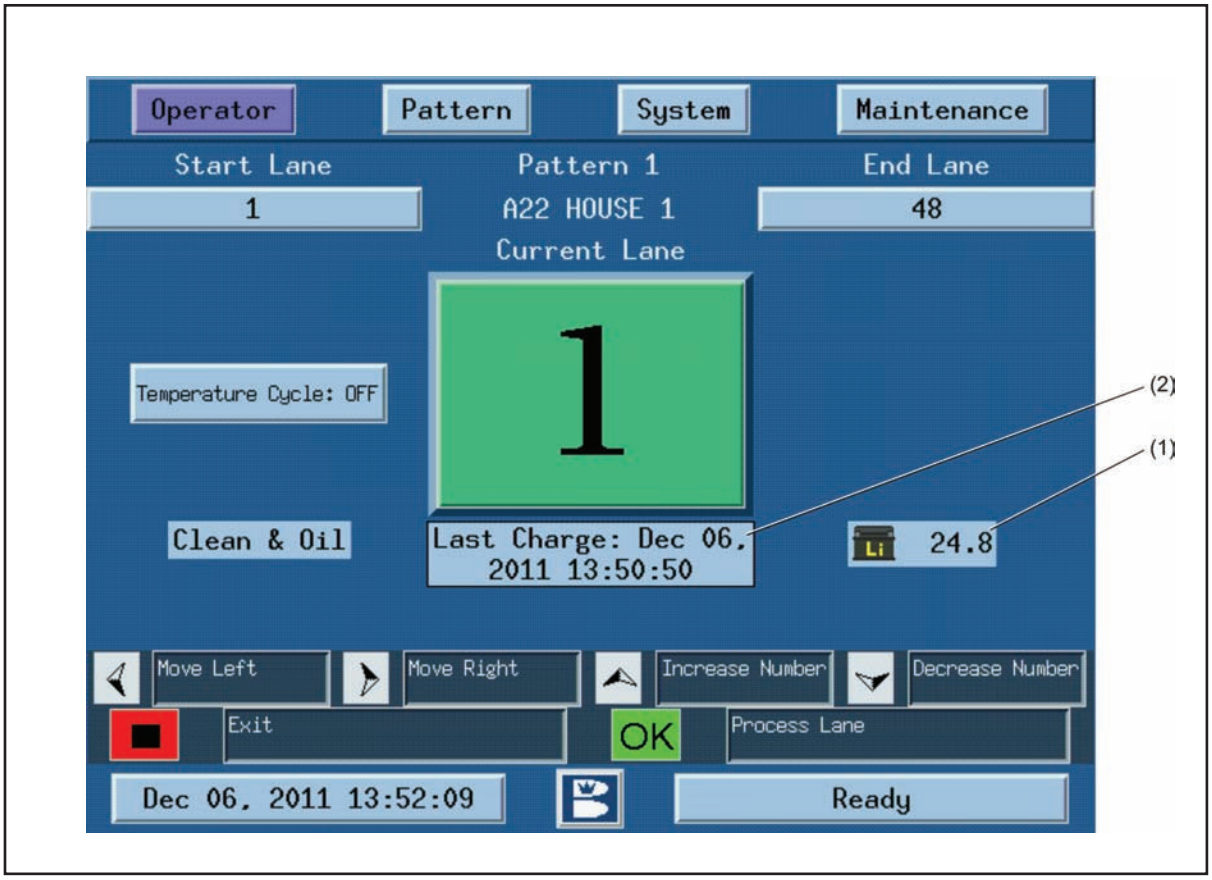


Figure 3-4. Operator's Screen

(1) BATTERY VOLTAGE BOX (2) LAST CHARGE BOX

High Voltage

The background will change to red whenever the voltage exceeds 30V. The text under the voltage box will display "Battery Voltage is too high". The charger solenoid will open the charging circuit when the voltage exceeds 30.3 volts, stopping the charging process.

Low Voltage:

The background will change to yellow and the text under the voltage box will display "Limited lanes remaining!" When the AGM voltage drops below 22.5v and the Lithium battery drops below 24.3v. The background will change to red and the text under the voltage box will display "Battery voltage is too low to run lanes" when the AGM voltage drops below 21.5v and the Lithium battery drops below 23.5v near the end of the previously run lane. The background color of the voltage box updates every few seconds. Do not be concerned if it changes color for a short time after the vacuum turns on. The battery voltage should recover when the Envoy is on the approach before running the next lane. You should be able to run up to 10 lanes without any loss in performance after the background changes to yellow. This indicates that the battery is ~75% discharged and has ~25% capacity left. You may only have 2 - 3 lanes remaining when the background color remains red. A full screen warning will be displayed on the GUI when the battery voltage drops below the threshold of the red background.

Last Charge Box

The **date/time that the battery was last fully charged** is displayed just below the Current Lane number. This is intended to assure that the previous operator properly charged the battery when expected. There are detailed log files showing the recorded voltage of the battery every 2 minutes while charging. There is also a log file of the voltage recorded at multiple times for each lane run.

VOLTAGE MONITORING BEEPER

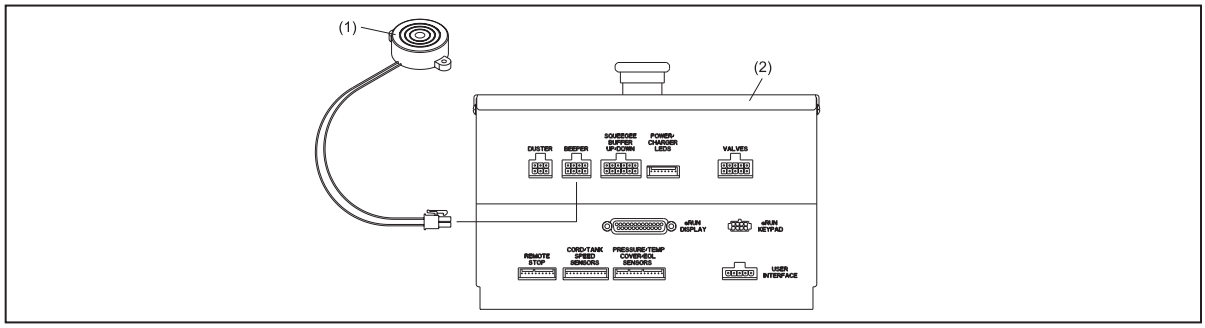


Figure 3-5. Voltage Monitoring Beeper

(1) BEEPER (2) ELECTRONIC ENCLOSURE

High Voltage

The beeper should activate at any time that the AGM battery voltage exceeds 30v or the Lithium battery voltage exceeds 30.4v.

Low Voltage

The beeper should activate at any time that the AGM voltage drops below 20.5v and the Lithium battery drops below 21.9v.

Charger Not Connected

The beeper should also activate if the battery charger has not been connected and there has been no operator/GUI activity for 20 minutes. This reminder beep is 1 second for every minute.

Section 4: Operating the Machine

Ready to get to work? Here's what you need to know to start, stop, and run the machine for normal, daily use. If you want detailed information about the sequence of operations, or to find out more about what's happening within the machine at each stage, see Sequence of Operations portion of **Section 6: Troubleshooting**.

In this section you will find:

1. What to know before you get started
2. Start-up procedure
3. Shutdown procedure
4. Storing the machine

BEFORE YOU START

Step 1: Check tanks and duster cloth supply roll to be sure the machine is ready to operate.

1. Make sure cleaner and conditioner supply tanks are properly filled and caps are properly tightened.
2. Make sure that the air was purged from the conditioner system if the conditioner system was completely empty. Refer to Maintenance & Service section 6.
3. Make sure waste recovery tank is empty.
4. Make sure there is enough cloth on the duster cloth supply roll to complete the number of lanes desired.

CAUTION! Fill and empty tanks with the machine in operating position (See "Finding Your Way Around the Envoy) and away from lanes and approaches. Use the no-spill containers to avoid spilling. Clean all spills and drips immediately.

Step 2: Position the machine on the approach.

1. With the machine in operating position, roll the machine to the first lane, about 2 feet away from the foul line.
2. Align the center mark on the machine with the center board of the lane.

START-UP PROCEDURE

Step 1: Supply power - BATTERY OPERATION

1. Unplug the battery charger cord from the 7 pin side of the machine.

NOTE: *The Envoy is designed to remain on at all times (24/7) including charging times. In the event that the power is off, turn on using the switch on the 7 pin side of the machine near the charging port for the battery charger.*

2. Place the machine in the operating position on the approach in front of the foul line.

NOTE: *If the GUI doesn't power up, check the main switch on the electronic enclosure or the 2 AMP in-line fuse near the green GUI power connector. Also rotate the emergency shut off switch clockwise 1/4 turn and release.*

3. The status window displays, "READY" in the lower, right box on the screen.

Step 1: Supply power - CORDED OPERATION

1. Unplug the battery cable and power type jumper from the Electronics Enclosure.

2. Plug in the AC/DC power supply (optional) cable and power type jumper into the Electronics Enclosure.

3. Plug one end of the power cord into the machine and the other end into the wall outlet. (115-volt, 50/60 HZ, 20 amp outlet or 230-volt, 50HZ, 15 amp outlet).

NOTE: *If the GUI doesn't power up, check the main switch on the electronic enclosure or check the 2 Amp in-line fuse near the green GUI power connector. Also rotate the emergency shut off switch clockwise 1/4 turn and release.*

4. Place power cord ring into the cord kill assembly.

NOTE: *The cord should follow the machine from lane to lane to avoid interference.*

5. The status window displays "READY" in the lower, right box on the screen.

Step 2: Press "OK" to prepare the machine to run.

NOTE: *During first usage you are required to download a pattern if you change the pattern or change the selected conditioner.*

1. The machine lowers the duster contact roller and squeegee into operating position, turns on the vacuum motor and pressurizes the conditioning system.

NOTE: *After the first lane, machine will pressurize the conditioning system when the reverse pass is completed.*

2. The display screen displays "Put the lane machine on the lane" when the machine is ready to begin operation.

3. Position the machine on the lane with the rear caster wheels aligned with the gutter just in front of the foul line. Use the handle magnetic catch to center the machine onto the lane.

4. The machine will pulse cleaner for 5 seconds, once the duster cloth contacts the lane surface.

Step 3: Press "OK" a second time to begin operation on first lane.

1. The machine accelerates forward, automatically cleaning and conditioning the lane until it reaches the pin deck.

    a. For a detailed look at these operations, see Basic Operations, in the Getting to know the Envoy section.

2. When the machine reaches the end of the pin deck, it reverses direction and returns to the foul line completing conditioning operation.

3. The GUI displays the number of the next lane to be cleaned and conditioned.

CAUTION! When using the AC power cord, manage the power cord so it does not get trapped under the lane machine. Replace the protective sleeve and heat shrink tubing on the power cord if they become damaged.

Step 4: Move machine to subsequent lanes.

1. When the lane is completed, pull the machine back about 3 feet from the foul line.

2. Turn machine and use the rear lane to lane wheels to steer it to the next lane. Press "OK" to prepare the machine to run and wait for the display screen to prompt "Put the lane machine on the lane."

3. Position the larger front wheels so they align with the gutter just in front of the foul line of the next lane.

4. Press "OK" to begin operation on the lane.

5. Continue same procedure on subsequent lanes.

NOTE: *In the event that you need to stop the machine in an emergency while it is operating on the lane, there are three possible safe options:*

1. The E-stop button in the top center of the machine will shut down all power when depressed. Twist the top of the switch clockwise and release to turn power back on. (This is also a good one to check if you cannot turn the machine on!)

2. If an AC power cord is being used, the cord kill switches on the left or right rear of the machine will stop the travel and functions of the machine when the power cord is pulled firmly by the operator. The operators choices after this are:

    a. Press "OK" to continue operations.

b. Press Left Arrow to return to the foul line.

c. Press Stop (red square) to stop all functions.

3. If DC battery power is being used, the remote stop transmitter (one of two supplied) should be pressed to activate the remote stop receiver located on the bottom of the electronics enclosure. This will stop the travel and functions of the machine. If the machine travel doesn't stop immediately, continue to press the transmitter button as the machine nears the end of the pattern, before it reaches the pinsetter. The operators choices after this are:

   a. Press "OK" to continue operations.

   b. Press Left Arrow to return to the foul line.

   c. Press Stop (red square) to stop all functions. Refer to Figure 4-1.

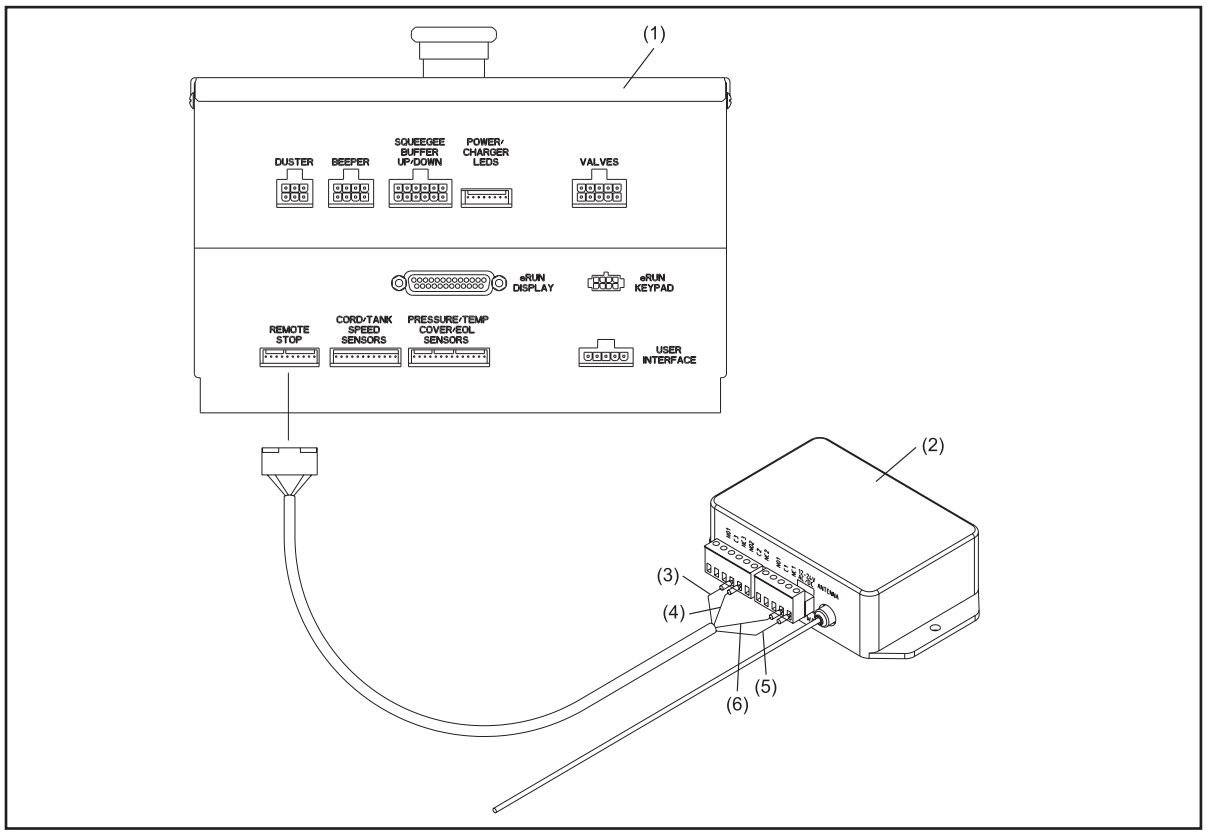


Figure 4-1. Remote Stop

(1) ELECTRONIC ENCLOSURE
(2) REMOTE STOP RECEIVER
(3) GREEN (NO2)
(4) WHITE (C2)
(5) RED (12 VDC)
(6) BLACK (GROUND)

SHUTTING DOWN

Step 1: Pull machine off of the lane and onto approach.

Step 2: Empty the waste recovery tank. This will allow time for the machine to depressurize the conditioning system.

Step 3 - CORDED: Remove power cord from machine and unplug cord at receptacle. This will shut down the graphical user interface (the LED will continue to blink as long as the short term memory is active).

Step 3 - BATTERY: If using the AGM or Lithium batteries, do NOT shut down the machine power, but connect to the battery charger as soon as possible.

CAUTION! Never raise the machine into transport position until you have emptied the waste recovery tank.

WARNING! When using the AC power cord, always disconnect it from the back of the machine before placing the machine in transport position.

STORING THE MACHINE

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

Step 1: Fill the lane cleaner and conditioner tanks before storing.

Step 2: Stand machine upright onto its transport casters.

Step 3: Wrap power cord in large loops for storage.

Step 4: Perform all daily maintenance tasks. See the Maintenance & Service Section for more information.

Step 5: Store machine in secure, warm location.

Step 6: Connect the charger to the lane machine, and then turn the charger on.

NOTE: *The red LED will illuminate when the charger circuit has activated. If the charger circuit fails to activate, the warning buzzer will sound – refer to the troubleshooting section.*

NOTE: *If the battery machine cannot be connected to the charger during storage, then fully charge the battery and turn off the machine power before storage.*

Section 5: Using the Graphical User Interface (GUI)

The Graphical User Interface (GUI) is powerful, yet intuitive and easy to use and understand. This section gives you a tour of the four primary menus of the GUI and provides step-by-step instructions for customizing the machine's operations in each of those areas.

In this section you will find:

1. An introduction to the GUI
2. The operator screen
3. The pattern menu
4. The system menu
5. The maintenance menu

INTRODUCTION TO THE GRAPHICAL USER INTERFACE (GUI)

The Graphical User Interface (GUI) is the interface between the user and the machine's computer control system. The GUI monitors the machine's operation, tells you when you need to replace or repair parts, and lets you customize just about every aspect of operation to the needs of your bowling center or the preferences of your bowlers.

NOTE: *"Oil" is used interchangeably with "conditioner" on the GUI display screen.*

The Elements of Most Display Screens

Most display screens have an upper menu bar that shows the four main content areas, a left-hand menu bar that lets you choose options within those four main screens and below the screen are the navigation buttons. A lower task bar also guides you in navigation, with the current date, time and status displayed at the bottom of the screen. Refer to Figure 5-1.

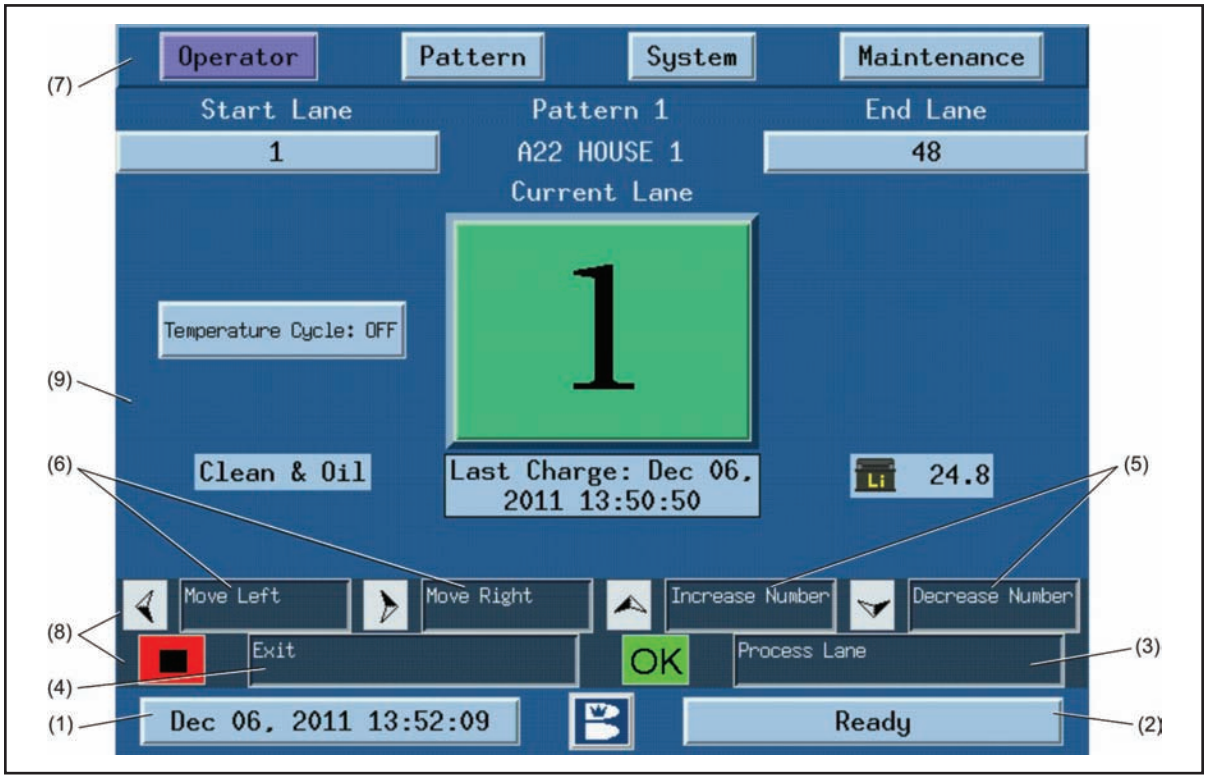


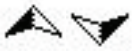
Figure 5-1. Screen Elements

(1) DATE AND TIME
(2) CURRENT STATUS
(3) OK = ENTER OR ACCEPT
(4) EXIT = BACK OR ESCAPE
(5) UP/DOWN ARROWS = MOVE UP OR DOWN, AND INCREASE OR DECREASE ITEM VALUE
(6) LEFT/RIGHT ARROWS = MOVE LEFT OR RIGHT
(7) UPPER MENU BAR
(8) LOWER TASK BARS = CUES TO NAVIGATION
(9) ACTIVE AREA

How to Navigate

Left/right arrow buttons let you move around between areas on the screen or select information in a content area.

Up/down arrow buttons let you move up or down or increase or decrease the value in an active box.



The “OK” button works like an “enter” or “return” button – it accepts, or says “yes,” to a selection.

The “Exit” button works like a “back” or “escape” button – taking you back to the previous screen. When you press “exit”, the GUI saves all changes made to that screen before exiting.

To Navigate Between the Four Main Menus

1. Press the “Exit” button until you reach the main screen (on this screen, the active area will be blank and only the upper menu bar with the names of the four main screens will be visible).

2. Use the left/right arrow buttons to select a screen from the upper menu bar. Then select that menu using the “OK” button.

To Navigate Between Choices in the Left Navigation Bar

1. Press the “Exit” button until you reach the main screen for that section –Operator, Pattern, System, or Maintenance (the active area of the screen will be blank and only the left menu bar will be visible). Refer to Figure 5-4.

2. Select a new choice in the left navigation bar using the up/down arrow buttons. Then select that screen using the “OK” button.

What Else You Should Know

Handle Controls

A secondary keypad on the machine's handle lets you control the machine from an upright position as you work. Refer to Figure 5-2.

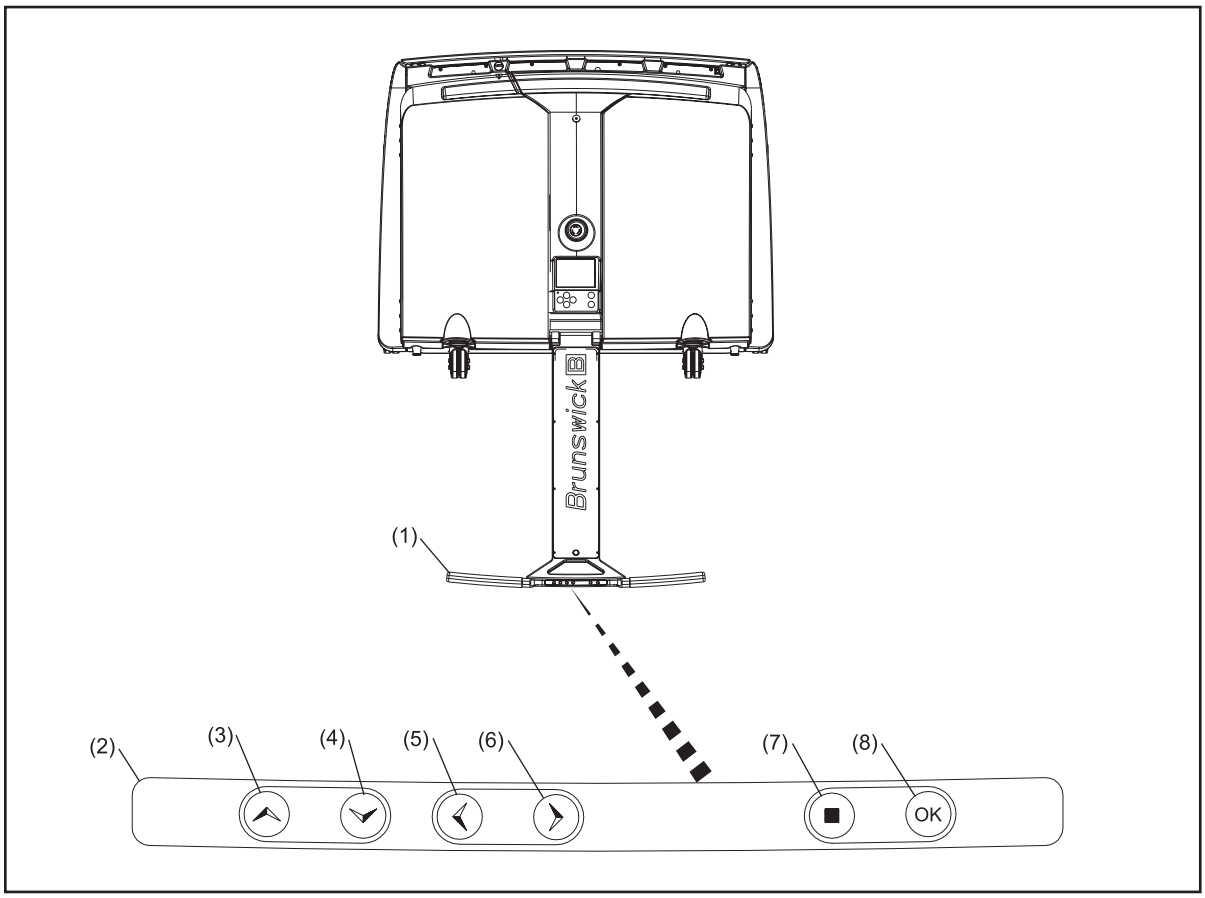


Figure 5-2. Handle Controls

(1) OPERATOR HANDLE
(2) HANDLE KEYPAD
(3) UP ARROW BUTTON
(4) DOWN ARROW BUTTON
(5) LEFT ARROW BUTTON
(6) RIGHT ARROW BUTTON
(7) EXIT BUTTON
(8) OK BUTTON

Screen Saver

A screen saver protects the screen against burn-in after the controller is inactive for about 5 minutes. In order to protect the battery power, the screen saver will shut off after an additional 10 minutes. Press "OK" to return to the active screen.

Removable GUI

The Envoy is supplied with a 12V DC power source so you can remove the GUI to change information, check counters, or design patterns from the comfort of your desk.

Security

Access to machine operations can be controlled by assigning Personal Identification Numbers (PINs) that prevent unauthorized access to the machine or its programs. Additionally, each user can be assigned one of two available levels of access based on their job function.

See the **Setting up PINs**, later in this section for more info on security levels and pin access.

Messages

Status messages: Status messages display in the lower right area of the control screen and remain visible on the screen until another status message is displayed. Status messages describe general information about the machine's current and normal operations. Examples: *ready, running.*

Warning messages: Warning messages alert you to minor issues that need to be addressed. Example: *low cleaner fluid.*

Error messages: Error messages alert you to operational issues that need to be addressed. An error message will stop the machine from running until the problem has been corrected. Example: *Squeegee switch is not working properly.*

Maintenance messages: Maintenance messages are warning messages that tell you when a replaceable part has reached its useful life. Maintenance messages display during start-up. Maintenance messages will not prevent the machine from running. Example: *duster cloth needs to be replaced.*

THE OPERATOR SCREEN

This screen displays during the normal operation of the machine. As you work, it gives you general information about the current setup and operation. When an area is highlighted in blue, that is an indication the area can be changed. Refer to Figure 5-3.

NOTE: *This screen may be PIN protected.*

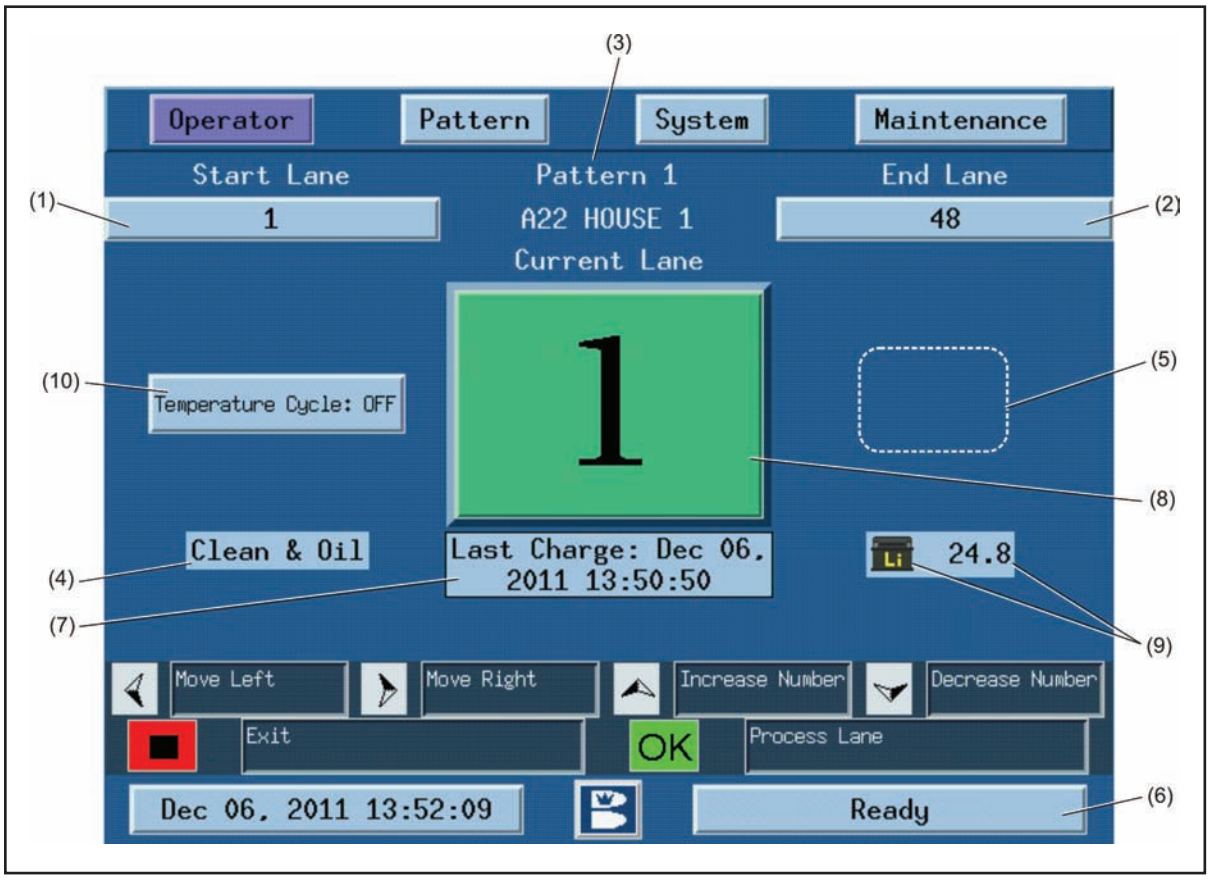


Figure 5-3. Operator Screen

(1) START LANE
(2) END LANE
(3) CURRENT PATTERN
(4) THE OPERATION (MODE)
(5) PATTERN OVERRIDE NOTICE – APPEARS WHEN RUNNING PATTERN OTHER THAN THE SCHEDULED PATTERN
(6) STATUS MESSAGE
(7) LAST CHARGE DATA
(8) CURRENT LANE
(9) VOLTAGE AND BATTERY TYPE
(10) OIL TEMPERATURE CYCLE STATUS

Changing the Start Lane

1. Go to the Operator screen.
2. Use the left/right arrows to navigate to “Start Lane”.
3. Use the up/down arrows to change the number of the start lane for this session.

NOTE: *When you exit the operator screen, the lane machine will return to its default “start lane” settings.*

Changing the End Lane

1. Go to the Operator screen.
2. Use the left/right arrows to navigate to “End Lane”.
3. Use the up/down arrows to change the number of the end lane for this session.

NOTE: *When you exit the operator screen, the lane machine will return to its default “end lane” settings.*

Skipping or Repeating Lanes

If you want to skip or repeat lanes during a session, you must change the “Current Lane” so the machine can maintain your place in the process. If you skip lanes, the GUI will direct you to return to the closest lane once you’ve completed the last lane in the normal sequence (the end lane).

1. Go to the Operator screen.
2. Use the left/right arrows to navigate to the “Current Lane”.
3. Use the up/down arrows to change the number of the lane you are currently on.

Turning on Temperature Cycle

If you occasionally need to heat the oil you may turn “on” the temperature cycle option from the operators screen. The temperature cycle can be operated in either the transport or operating positions and should only be used while charging the batteries or plugged into an AC power source. Running the temperature cycle when not charging will discharge the batteries and could reduce the number of lanes possible on a charge. To temporarily turn “on” the temperature cycle:

1. Go to the Operators screen.
2. Use the left/right arrows to navigate to the Temperature Cycle option.
3. Use the up/down arrow to activate the temperature cycle.

For consistent use of the temperature cycle feature, you can use the Temperature Cycle Scheduler in the Systems Menu.

Battery Voltage and Power Type

1. The battery voltage and power type are displayed on the lower right of the Operator screen of the GUI.

Last Charged Box

1. The date/time that the battery was last fully charged is displayed just below the Current Lane number. This is intended to assure that the previous operator properly charged the battery when expected. The Envoy keeps detailed log files of the battery voltage every two minutes while charging, and also at multiple times for each lane run.

THE PATTERN SCREEN

NOTE: *This screen may be PIN protected.*

The pattern screen lets you select, change, design, or override a lane conditioning pattern. The Envoy comes pre-programmed with 10 conditioning patterns. You may use these patterns as your own, or use them as templates to create customized patterns – just find the pattern that's closest to what you want and then adjust the zone lengths and oil volumes. You can return to the original default patterns at any time. Refer to Figure 5-4.

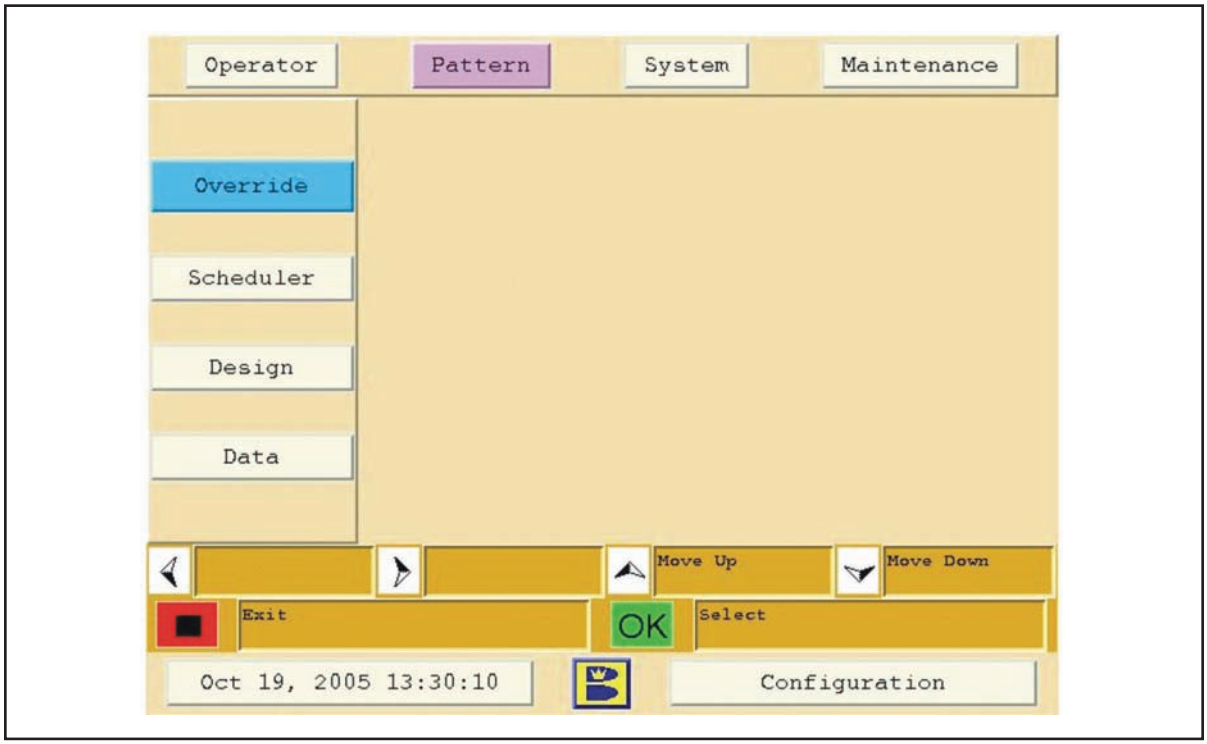


Figure 5-4. Pattern Screen

Override lets you override the scheduled conditioning pattern and select another programmed pattern for this session.

Scheduler lets you program the machine to automatically use different conditioning patterns on different days of the week, times of day, or both. The scheduler will also allow you to run different conditioner patterns on specific lanes within those days or times of day.

Design lets you change the patterns and customize the type of operation, speed of travel, distances at which to start different operations, and whether to split the cleaning and conditioning operations.

Data lets you save your custom patterns, restore previously saved patterns, or restore default patterns.

Pattern Override

The Pattern Override enables the user to select and run a conditioner pattern that is different than scheduled pattern. When the system security feature is used, level 1 and level 2 users are able to access this option, a PIN number may be required for access. Each pattern override is recorded in the "Pattern Run Log" in the "Maintenance" menu under "Logs". Refer to Figure 5-5.

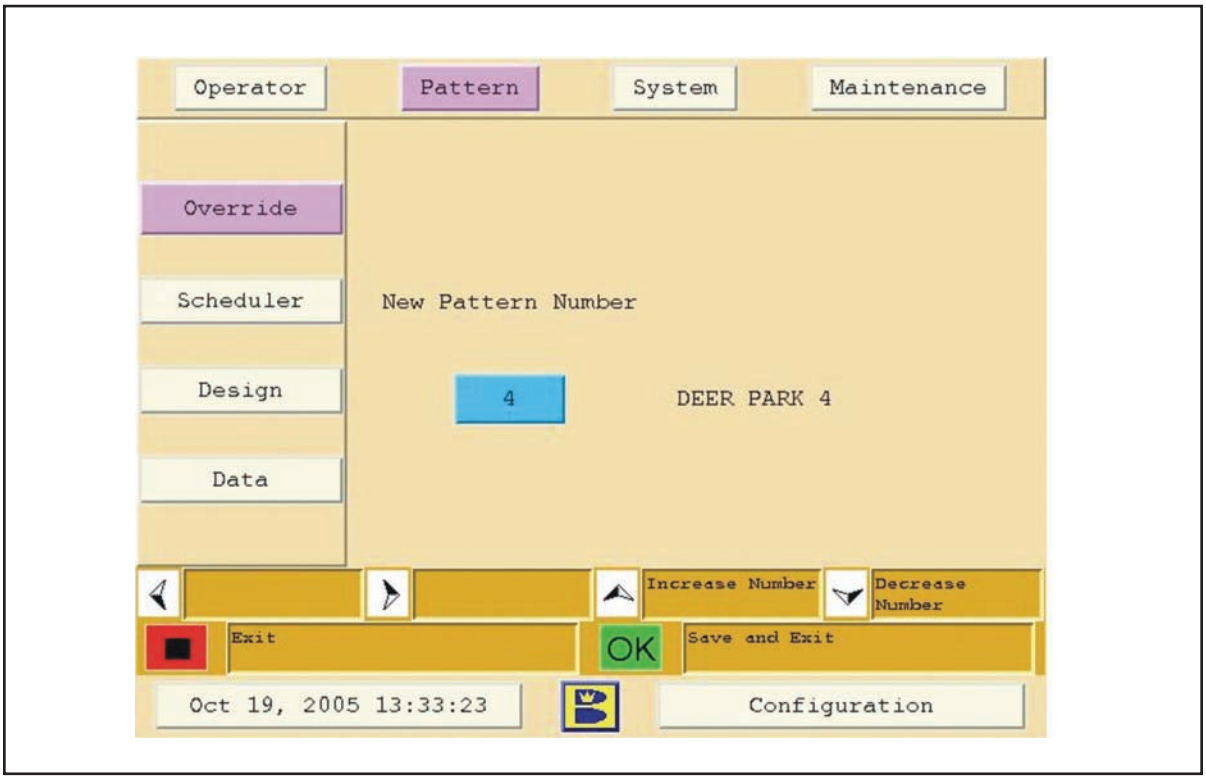


Figure 5-5. Pattern Override

Overriding the Conditioning Pattern

1. Go to the Pattern menu.
2. Select "Override". Press "OK".
3. Use up/down arrows to select a new pattern number.
4. Press OK.

NOTE: *After you press "OK", the GUI will return to the operator screen to begin running the new pattern and "Pattern Override" will display next to the current lane.*

NOTE: *If EXIT is pressed while in the Pattern Override screen, the selected override will not be saved.*

NOTE: *The override pattern remains active until you exit the operator screen.*

Pattern Scheduler

Lets you schedule different conditioning patterns for up to 3 time periods per day, 7 days per week, and for up to 5 different ranges of lanes to accommodate different types of bowlers and leagues. Refer to Figure 5-6.

NOTE: *This screen may be PIN protected.*

NOTE: *Make sure that a certified Brunswick installer has set up the number of lanes in your center from the system menu before you start setting up your Pattern Scheduler.*

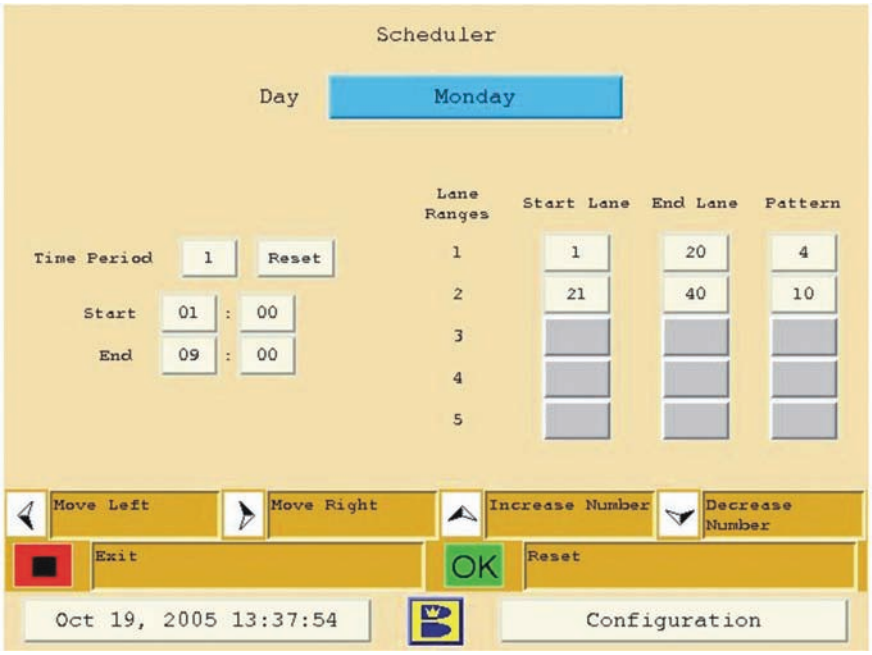


Figure 5-6. Pattern Scheduler

Setting up a Cleaning/Conditioning Schedule that Varies by Time, Day or Lane Number

1. Go to the Pattern menu.
2. Use the up/down arrows to navigate to “Scheduler”. Press “OK”.
3. Select the day of the week.
    a. Use the right/left arrows to navigate to the day of the week.
    b. Use the up/down arrow to select the day of the week.
4. Select a time period (up to 3 time periods per day).
    a. To use the same pattern all day, use the default settings:
        1) Time period = 1

2) Start time is 1:00, end time is 23:59

b. To use different patterns during different times of the day, enter start and end times for up to 3 time periods per day.

5. Select lane ranges & patterns.

a. To use the same pattern on all lanes, use the default setting:

1) Lane range = 1

2) Start lane is 1, end lane is 40 (total number of lanes in center)

6. Select a pattern for that range.

a. To use different patterns on different lanes:

1) Select the start and end lane for up to 5 lane ranges.

2) Select a pattern for each lane range.

NOTE: *If any day or time period is left without a scheduled pattern, all lanes will run on the default pattern (pattern 1). Please check to make sure that you have not allowed time gaps between any of the 3 allowable time periods. These gaps could result in an unexpected pattern selection if the lane machine is in operation during that time gap.*

7. Press “exit” to save and return to the previous screen.

Pattern Design

This menu allows you to program custom information for each conditioning pattern, including pattern shape and volume.

The first screen in your Pattern Design menu is the Pattern Parameters screen. This screen allows you to customize specific functions and modes for each of the 10 patterns. Refer to Figure 5-7.

NOTE: *This screen may be PIN protected.*

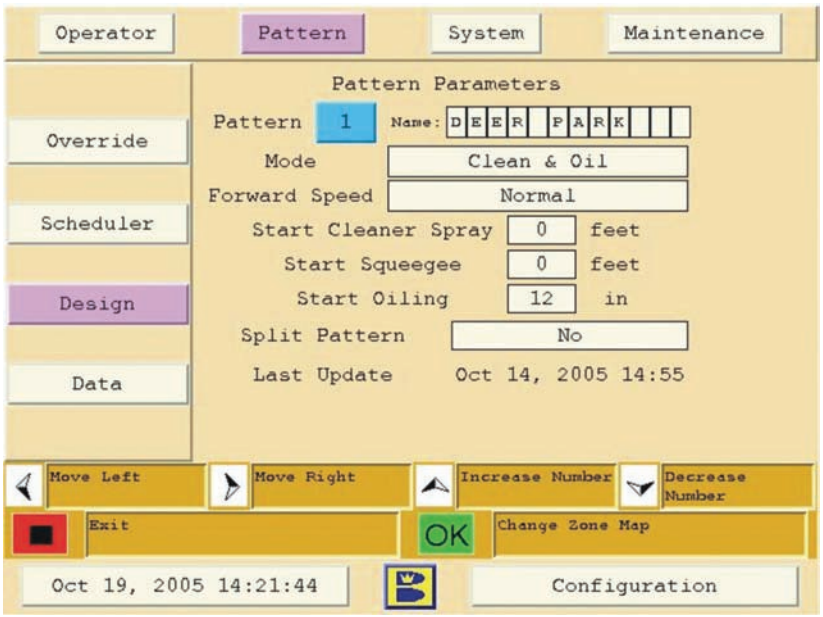


Figure 5-7. Pattern Design

Pattern Number and Name

You can select one of 10 preset patterns or customize any pattern to perform based on your bowlers needs. You can also assign a name to each pattern making it easier to keep track and identify.

Changing the Pattern Name or Number

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the up/down arrows to select the pattern number.
4. Use the left/right arrows to select the pattern name.
5. Use the up/down arrows to change the pattern name.
6. Press “exit” to save and return to the previous screen.

Mode

The mode allows you to select the type of operation you wish to perform for that pattern. You can select between clean and oil, clean only, and oil only. The clean and oil mode cleans and condition the lanes in one forward and reverse run. The clean only mode uses only the cleaning system, and the oil only mode will only apply conditioner. To separate the clean and condition mode into a two-run operation refer to “Split Pattern” later in this section.

Changing the Mode of Operation

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the left/right arrows to navigate to “Mode”.
4. Use the up/down arrows to select:
    a. Clean & Oil
    b. Oil
    c. Clean
5. Press “exit” to save and return to the previous screen.

Forward Speed

The Envoy offers you three choices of travel speeds: “Quick Clean”, “Heavy Clean” and “Max Clean”. In most instances the machine will operate in the “Heavy Clean” speed (~24 inches per second). The “Quick Clean” speed (~27 inches per second) will reduce the cleaning time and battery drain for centers using lighter volumes of conditioner. The “Max Clean” speed (~21 inches per second) will increase the cleaning time and battery drain for centers using heavier volumes of conditioner.

Changing the Machine’s Operating Speed

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the left/right arrows to navigate to “Travel Speed”.
4. Use the up/down arrows to select.
    a. Max Clean
    b. Heavy Clean
    c. Quick Clean
5. Press “exit” to save and return to the previous screen.

Start Cleaner Spray

This option allows you to set a distance down the lane, in feet, to start spraying cleaner. It is designed for use on patterns that require the back end of the lane to be cleaned without cleaning the entire lane. We also recommend using this option if you have wood lanes and the head (maple) section has feathering (splintering between boards) or board separation. Software prevents your start cleaner spray distance from being shorter than the start squeegee distance.

Changing the Distance from the Foul Line at which Cleaning Starts

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the left/right arrows to navigate to “Start Cleaner Spray”.
4. Use the up/down arrows to select number of feet from the foul line you want to start cleaning.

NOTE: *Default setting is 0. Select any distance up to 57 feet. The default setting, allows the machine to spray a single pulse of cleaner as soon as the duster cloth contacts the lane surface. Values above zero will start to spray at that selected distance.*

5. Press “exit” to save and return to the previous screen.

Start Squeegee

The start squeegee option is the counter part to the start cleaner spray option when used for cleaning the back end of the lane. It also allows you to “dry” squeegee the conditioner from old wood lanes showing feathering or board separation leaving a thin film of oil that will help protect the wood surface. Measured in feet, this option may be turned on before the cleaner spray starts, but not afterward.

Changing the Distance from the Foul Line at which the Squeegee Starts

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the left/right arrows to navigate to “Start Squeegee”.
4. Use the up/down arrows to select the number of feet from the foul line you want to start the squeegee.

NOTE: *Default setting is 0. Select any distance up to 57 feet. The number must be less than or equal to the “start Cleaner Spray” distance.*

5. Press “exit” to save and return to the previous screen.

Start Oiling

This option is used as a safety feature on the lane machine. Select a start distance from the foul line to start conditioning, in 6 inch increments up to 24 inches. This prevents any applying or buffing of oil within that distance from the foul line, leaving it clean so recreational bowlers have less tendency to track oil onto the approaches. A level 2 security ID will allow you to set the minimum distance in the System Settings menu.

Changing the Distance from the Foul Line at which Conditioning Starts

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the left/right arrows to navigate to “Start Oiling”.
4. Use the up/down arrows to select the number of inches from the foul line you want to start the conditioning operation.

NOTE: *Default setting is 6”. Select between 6”, 12”, 18” and 24”.*

5. Press “exit” to save and return to the previous screen.

Split Pattern

The split pattern option enables the user to separate the “clean & oil” mode into two separate runs of the machine performed on the same lane. By selecting “Yes” the machine will travel down the lane performing the cleaning operation and return to the foul line. Then by the user’s action, the machine will travel down the lane performing the conditioning operation and also buffing the pattern on the reverse. When “No” is selected the machine will clean and condition the lanes in one operation.

Splitting the Pattern to Separate Cleaning and Conditioning Functions

1. Go to the Pattern menu.
2. Select “Design” & press “OK”.
3. Use the left/right arrows to navigate to “Split Pattern”.
4. Use the up/down arrows to select yes to separate the cleaning and conditioning patterns into two operations.
5. Press “exit” to save and return to the previous screen.

Last Update

The last update is a feature that allows you to see if and when a conditioning pattern was last modified. This proves helpful when trying to troubleshoot the pattern or if the pattern was suspect to an unauthorized modification. The "Pattern change log" stores each time the pattern or its parameters are modified.

Checking the Date and Time a Pattern was Updated

1. Go to the Pattern menu.
2. Select "Design" & press "OK".
3. Use the up/down arrows to select the number of the pattern you are checking on.
4. See "Last Update" at the bottom of the active area of the screen.
5. Press "exit" to return to the previous screen.

Additional Pattern Design Screens

Two additional screens may be accessed in the pattern parameters screen. These additional screens are the *Zone Configuration* screen and the *Oil* Levels screen. Please observe the following steps to gain access to both of these design screens.

NOTE: *Changes made to the Zone Configuration screen or the Oil Level screen will require a new download of the pattern to the machine control board.*

Creating or Changing a Conditioning Pattern

1. Go to the Pattern menu.
2. Select "Design" & press "OK".
3. Use the up/down arrows to select the number of the pattern you want to modify.
4. Press "OK" to go to the Zone Configuration screen, details follow.

Zone Configuration Screen

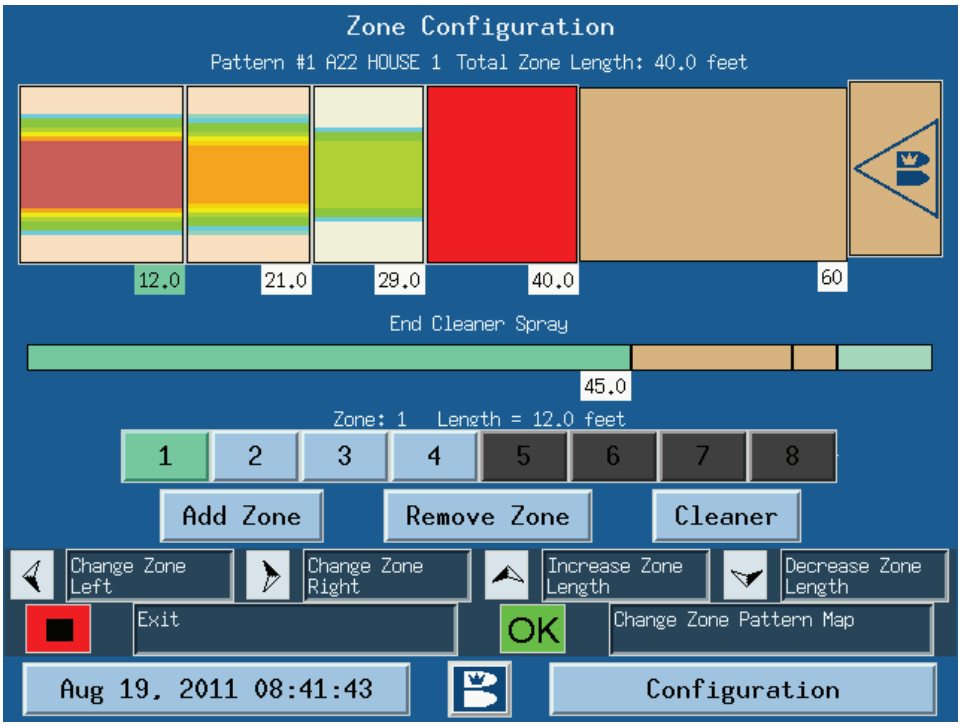


Figure 5-8. Zone Configuration

The Zone Configuration screen shows conditioner patterns graphically to make it easy to visualize and change the zones and the oil volumes.

You can create anywhere from 1 to 8 zones in a pattern. A zone can be between 3 and 57 feet long and can be adjusted in increments of .5 feet. The Zone Configuration screen displays the length of each zone and the distance to the end of the zone from the foul line. Within each zone, oil levels for each board are shown and screen colors are based on oil volumes selected. Refer to Figure 5-8.

Modifying a Zone

1. Use the left and right arrow to navigate to the zone number you wish to modify.

2. Use the up and down arrows to increase or decrease the length of the zone.

3. After making the modification you may choose another zone to modify, or press “OK” to enter the “Oil Levels,” or you may “Exit” to save the changes.

NOTE: *The GUI will prompt you to download the pattern to the machine control board after you exit the zone configuration screen. Press “OK” to start the download or “Exit” to download at a later time.*

Adding a Zone

1. Use the left and right arrow to navigate to the “Add Zone” button.

2. Press “OK” and a new zone will appear at the end of the last zone in the pattern.

3. Use the up and down arrows to adjust the length of the new zone.

Removing a Zone

1. Use the left and right arrow to navigate to the “Remove Zone” button.

2. Press “OK” and the zone closest to the pin deck will be removed.

3. Use the up and down arrows to adjust the zones to desired distances.

Modifying the Cleaner Spray Distance

The cleaner is applied in a continuous spray to the lane during the cleaning operation. You can select the distance at which the cleaner spray ends between 45’ and 57’. This lets you synchronize the cleaner usage with each patterns cleaning needs. The cleaner can be turned off earlier, allowing the surplus cleaner in the scrubbing vacuum head assembly to clean the back ends of the lane. The Envoy will always spray the pin deck with cleaner.

1. Use the right/left arrows to navigate to “End Cleaner Spray.”

2. Use the up/down arrows to increase or decrease the number of feet at which the cleaner spray ends (between 45’-57’).

3. Press “Exit” to save and return to the previous screen.

Oil Level Screen

The Oil Levels screens allow you to look at the shape of the pattern within a zone. You can make adjustments to individual boards or you may select a group of boards to adjust. This screen is accessed through the Zone Configuration screen in the Pattern design menu. Refer to Figure 5-9.

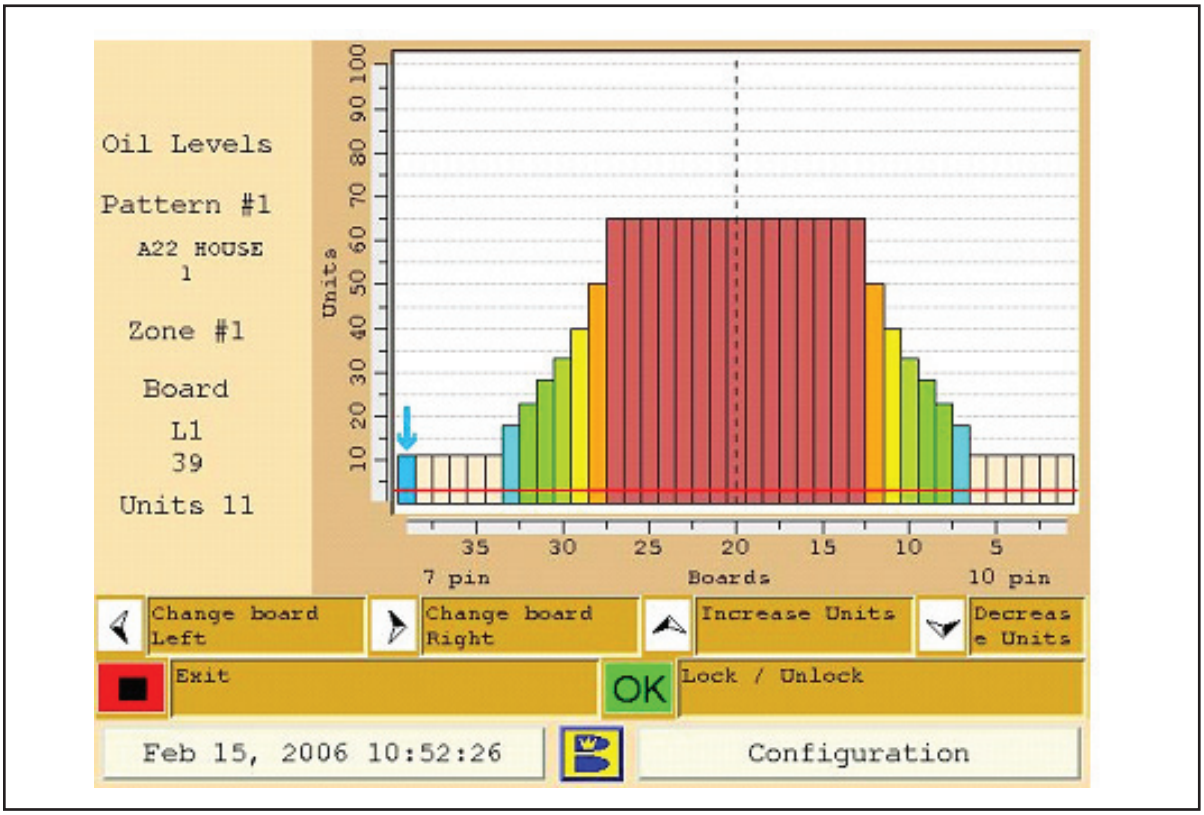


Figure 5-9. Oil Level

From the Zone Configuration screen, use the following steps to enter into the Oil Levels screen.

NOTE: *Changes made in the Oil Levels screen will require a new download of the pattern to the machine control board.*

1. Use the left/right arrow to navigate to select the zone you want to adjust.

2. Press “OK” to go to the “Oil Levels” screen.

NOTE: *The Oil Levels screen lets you adjust the amount of oil applied to each of the 39 boards in each zone of your pattern. Oil levels are measured in “units of oil”, the USBC standard, and are adjustable in 1-unit increments. The USBC minimum oil volume of 3 units is shown as a red line on the oil levels graph.*

3. Use the left/right arrows to select the board you want to adjust (numbered 1-39 from the right of the screen or L2 (left 2 board) to R2 (right 2 board). Refer to Figure 5-10.

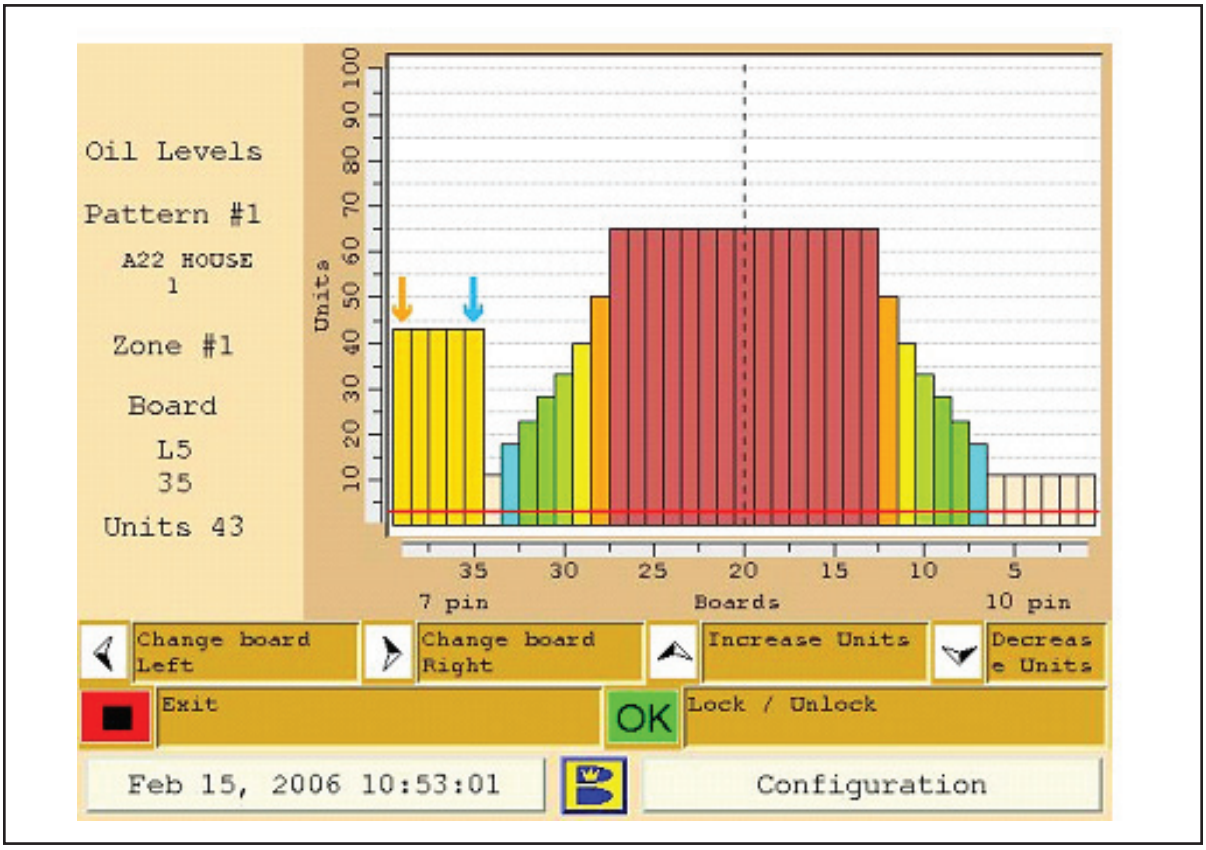


Figure 5-10. Oil Level

4. Use the up/down arrows to increase or decrease the amount of oil to be applied to a board. Continue on all boards, as needed.

    a. To change oil levels for groups of boards:

        1) Use left/right arrows to select the first board in the group, press “OK”.

        2) Use the left/right arrows to select the last board in the group (Do NOT press “OK” again).

        3) Use the up/down arrows to adjust oil volume.

        4) Press “OK” again to “unlock” the selected group of boards.

5. To adjust oil volume in other zones, Press “exit” to return to the previous screen and follow the same procedure for other zones.

6. Press “exit” to save and return to the previous screen.

Pattern Download

Each time a conditioner pattern is modified, the GUI is required to “download” the pattern data to the machine control board inside the electronic enclosure before that conditioner pattern can be run on any lane. The download message will appear when you “Exit” the “Zone Configuration” screen or if you are in the operator screen and a pattern has not been downloaded since it was last modified. Refer to Figure 5-11.

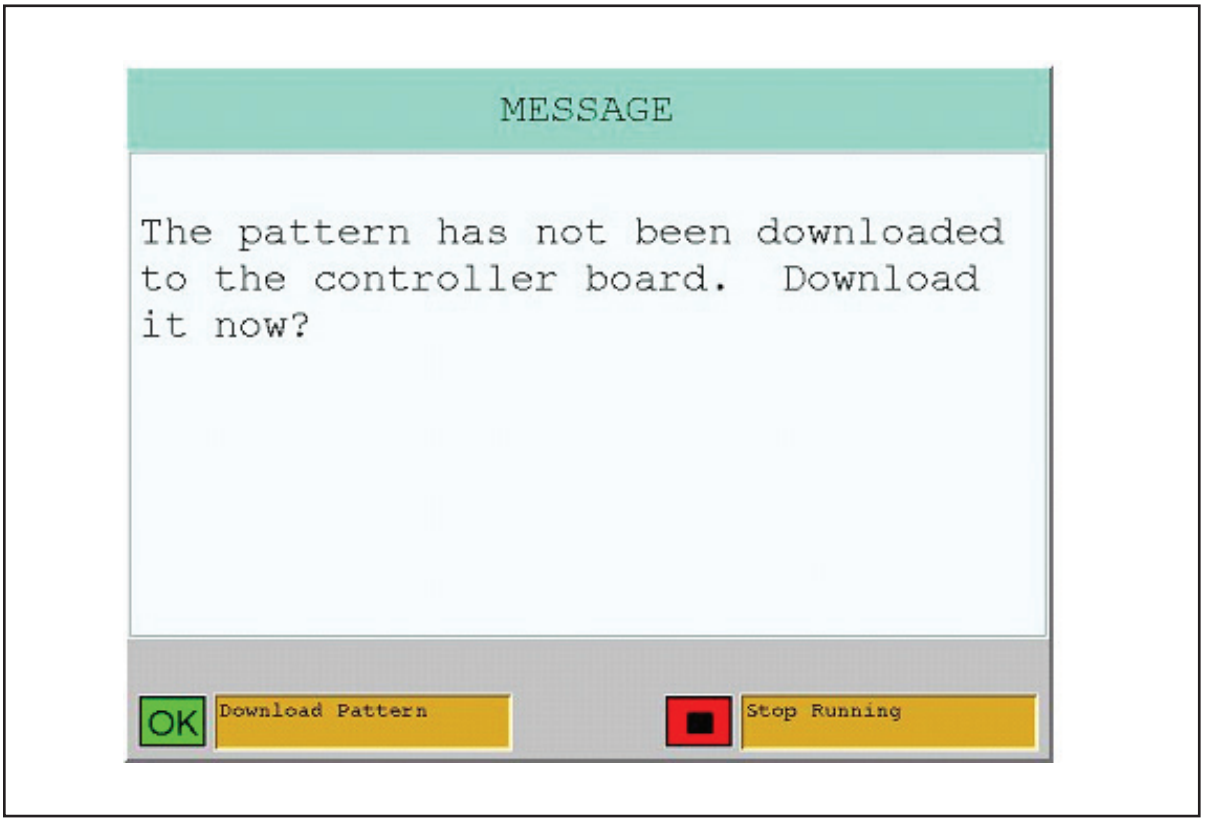


Figure 5-11. Pattern Download

The download time is approximately 4 minutes. A download progress bar will appear along with the pattern number and name. If necessary the download may be aborted by pressing “Exit”. Refer to Figure 5-12.

NOTE: *Any new or revised pattern must be downloaded from the GUI active memory to the machine control board to perform a conditioning run using that pattern. When the pattern is downloaded from the Operators screen the machine will prepare to run when the download is completed. The vacuum motor will run and the machine will instruct the operator to place the machine on the lane. Download from the Pattern Design Screen to avoid the vacuum motor turning on at the end of the downloads.*

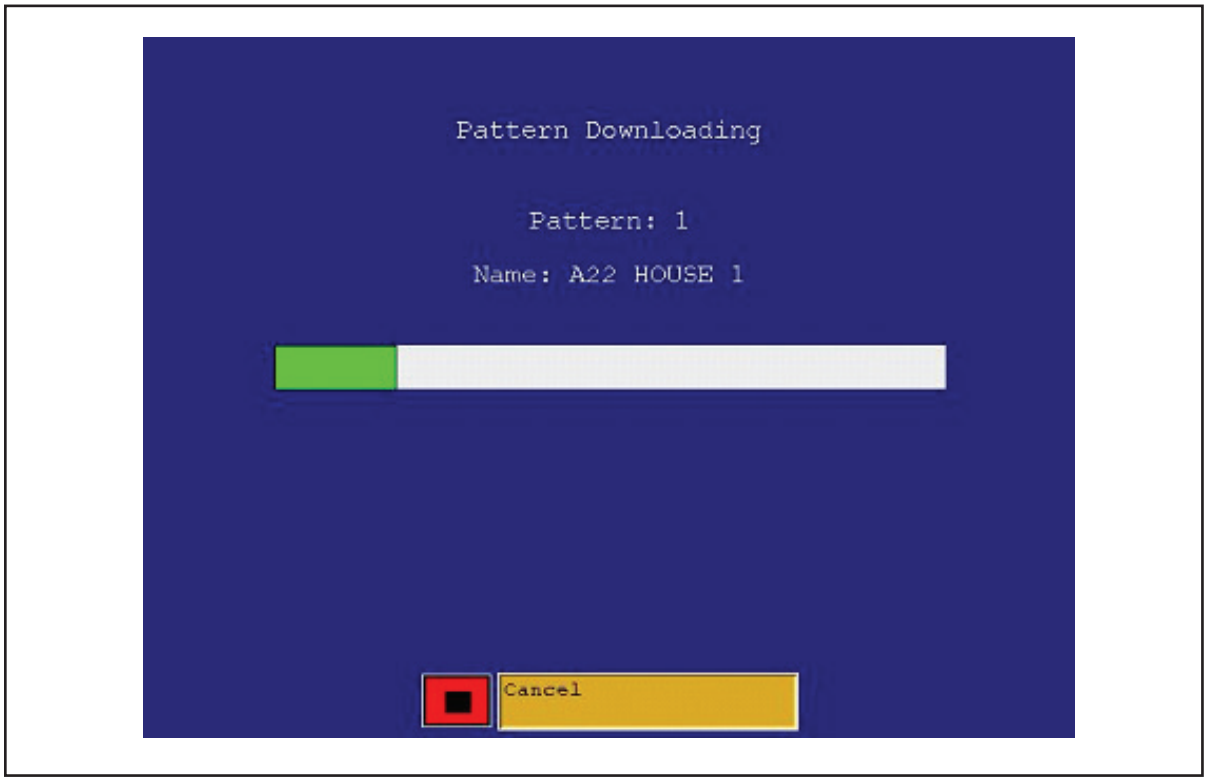


Figure 5-12. Download Progress

NOTE: *All patterns must be downloaded after changing to a different conditioner selection. To avoid unnecessary downloads, select your desired conditioner from the System menu before downloading patterns.*

Patterns and Memory

Before explaining the Pattern Data options, it is important to define the different locations for the lane machine patterns and memory.

"Active GUI Memory" There are 10 patterns available in the Active GUI Memory that can be run or modified as explained in the pervious manual sections on the use of Pattern Screens.

"Machine Control PCB Memory" There are 10 pattern locations in the Machine Control PCB Memory that can individually be downloaded from the Active GUI Memory. Any individual pattern that has been downloaded into the Machine Control PCB Memory can be selected and run without delay. If a change is made on any pattern in the Active GUI Memory, it must be downloaded again before it can be run.

"GUI Back-Up Files" There are 5 Back-Up Files in the GUI memory, each containing 10 patterns that can be exchanged with the 10 patterns in the Active GUI Memory. The Save Pattern Data option can be used to copy the 10 patterns in Active GUI Memory into one of the 5 GUI Back-Up Files. The date and time that the 10 patterns were saved in the GUI Back-Up Files will be used as the file name. The Restore Pattern Data option can be used to move the 10 patterns from any of the 5 GUI Back-Up Files back to the Active GUI Memory. The Restore Default Data option can always be used to move the 10 original patterns at the time of the machine installation back into the Active GUI Memory. This will be explained in more detail in the "Pattern Data" section of this manual.

"USB Drive Files" There are five files in the USB Drive Memory, each containing 10 patterns that can be exchanged with the 10 patterns in the Active GUI Memory. To start this process, the USB flash drive should be inserted into the GUI USB port. The export option can be used to copy the 10 patterns in Active GUI Memory into one of the five USB Drive Files. The date and time that the 10 patterns in Active GUI Memory into one of the 5 USB Drive Files. The date and time that the 10 patters were saved in the USB Drive Files will be used as the file name. The import option can be used to more the 10 patterns from any of the five USB Drive Files back to the Active GUI Memory. This will be explained in the Importing/Exporting section of this manual.

"Pattern Manager and Editor Software" This is pc software that is designed for Direct+ lane machines that allows you to manage your own pattern library. The pattern editor allows you to create new patterns or modify existing ones. You can also view your logging files and follow the machines history in chronological order. Patterns and files can be imported or exported to the lane machine using a USB drive. The Pattern Manager software can be downloaded free through our web site by visiting: http://www.brunswickbowling.com/lane-maintenance/pattern-library.

NOTE: *You can NOT exchange any of the 5 files directly between the USB Drive Files and the GUI Backup Files. Only one file containing 10 patterns can be exchanged between the Active GUI Memory and the USB Drive Files or the GUI Backup Files. To move all five files between the USB Drive files and GUI Backup Files, you must first import/export or save/restore each file of 10 patterns with the Active GUI Memory. Refer to Envoy PCB/GUI/USB Pattern Data Diagram on the following page.*

Electronic Enclosure			GUI									
(Individual Downloaded Machine Patterns)			(10 Live GUI Patterns)				"GUI Back Up Files"					
"Machine Control PCB Memory"		Each selected pattern is **Individually** Downloaded FROM the "Active GUI Memory (10 patterns)" TO the corresponding pattern # in the "Machine Control PCB Memory"	"Active GUI Memory"		Only the selected **File of 10** patterns is Backed Up or Restored between the "10 Live GUI Patterns" and the "GUI Back Up Files"		(Available GUI Memory to <Restore to or >Save Data from Active Memory)					
	Pattern Name, File # & Selected Conditioner			Pattern Name & File #			Backup 1	Backup 2	Backup 3	Backup 4	Backup 5	Default
				Saved Date of File #			Mar 3, 2008					
Pattern #1	A22 House 1	↔	Pattern #1	A22 House 1			A22 House 1					A22 House 1
Pattern #2	Maple Lanes House	↔	Pattern #2	Maple Lanes House			Maple House					A22 House 2
Pattern #3		↔	Pattern #3	Maple Lanes League 1			Ladies & Sr					Ladies & Sr
Pattern #4	Maple Lanes League 2	↔	Pattern #4	Maple Lanes League 2			Open Play					Open Play
Pattern #5		↔	Pattern #5	Maple Lanes Youth			Maple Youth					Competitive1
Pattern #6	Competitive2	↔	Pattern #6	Clean Only			Clean Only					Competitive2
Pattern #7		↔	Pattern #7	Maple Lanes Sport			Maple Sport					Sport 3-1
Pattern #8		↔	Pattern #8	Sport 2'5-1			Sport 2'5-1					Sport 2'5-1
Pattern #9		↔	Pattern #9	Sport 2-1			Sport 2-1					Sport 2-1
Pattern #10	Sport Flat	↔	Pattern #10	Maple Lanes Flat			Sport Flat					Sport Flat
	Note: The lane machine can run any individual pattern that has been selected and downloaded from the Active GUI Memory to the Machine Control PCB Memory. There can be empty pattern numbers in the Machine Control PCB Memory without causing problems. The Machine Control PCB Memory can contain individual patterns from previous GUI Back-Up Files (Pattern #7 could be from GUI Back-Up File 3). If the Active GUI Memory Pattern #7 has different pattern parameters or conditioner selection, the new parameters would need to be downloaded before running pattern #7 or the Active GUI Memory would need to be switched to Back-Up File 3.)			USB Memory Stick - Flash Drive								
							"USB Drive Files"					
					Only the selected **File of 10** patterns is Imported or Exported between the "USB Drive Files" and the "10 Live GUI Files"		(Pattern Data in USB Memory Stick avaiulable to Import/Export)					
				Saved Date of File #			Backup 1	Backup 2	Backup 3	Backup 4	Backup 5	
				Pattern #1			Oct 7, 2007					
				Pattern #2			ABC House					
				Pattern #3			A22 House 2					
				Pattern #4			Tournament					
				Pattern #5			ABC Open					
				Pattern #6			Test Shot					
				Pattern #7			Top Hat					
				Pattern #8			ABC Sport					
				Pattern #9			Sport 2-1					
				Pattern #10			Clean Only					
							ABC Flat					

Envoy PCB/GUI/USB Pattern Data Diagram

Pattern Data

This screen allows the user to save pattern data, restore default data, and restore saved conditioner pattern data within the GUI memory. The GUI can store 50 patterns, 10 patterns in each backup file. Each file will display a date and time if already used. Refer to Figure 5-13.

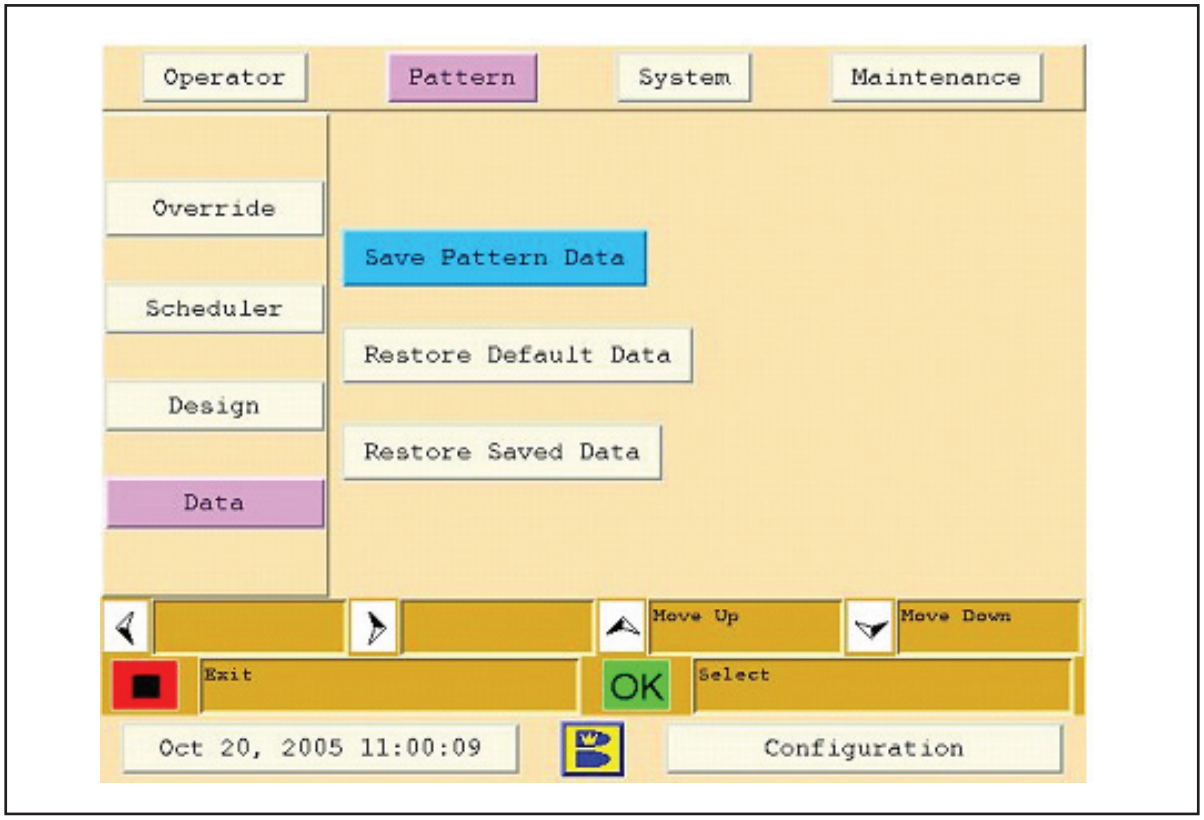


Figure 5-13. Pattern Data

Steps for saving, restoring default, and restoring saved data:

1. Go to the Pattern menu and press “OK”.

2. Use the up/down arrows and select Data by pressing “OK”.

3. Select the option you wish to perform by navigating with the up/down arrows and press “OK” and the following screen will appear. Refer to Figure 5-14.

NOTE: *The backup screen will not appear when restoring the default patterns. Only the 10 patterns in the active GUI memory are saved when you select the “Save Pattern Data” option. These 10 patterns are saved in the GUI backup memory in any of the five available backup folders with the date and time that the file was saved. A backup folder without a date is an empty folder. Saving to a folder with an existing date/time will replace the pattern date with the current date/time and active GUI memory patterns.*

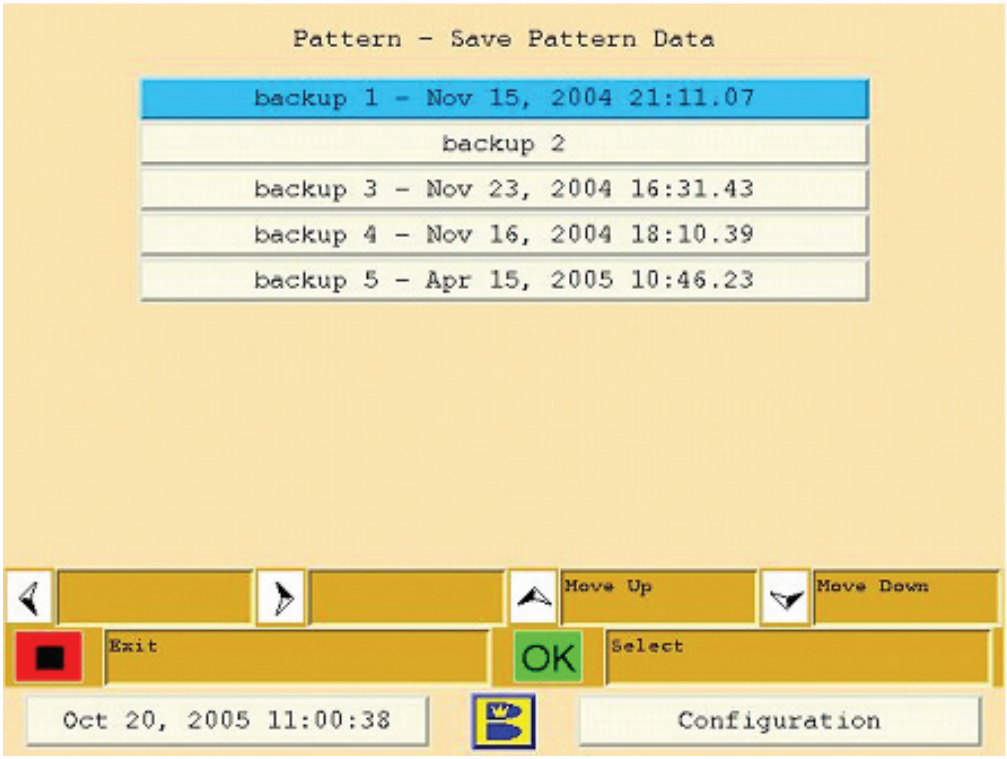


Figure 5-14. Save Pattern Data

4. For saving data or restoring saved data, you may select one of the five available backup folders and press “OK”.

NOTE: *Backup files may be over written when saving pattern data. Be sure that the data is saved to a file that is not used or saved to a file in which you no longer need the previously saved data.*

NOTE: *Pattern data can be backed up and imported to a USB flash drive as explained earlier in “Backing Up and Importing Data” in Section 4. This function saves the entire system data, including the PIN ID number, Pattern Scheduler, Conditioner Selection and Maintenance Logs. Do not import backup data from another center unless you know their PIN ID numbers and intend to change your entire system data file.*

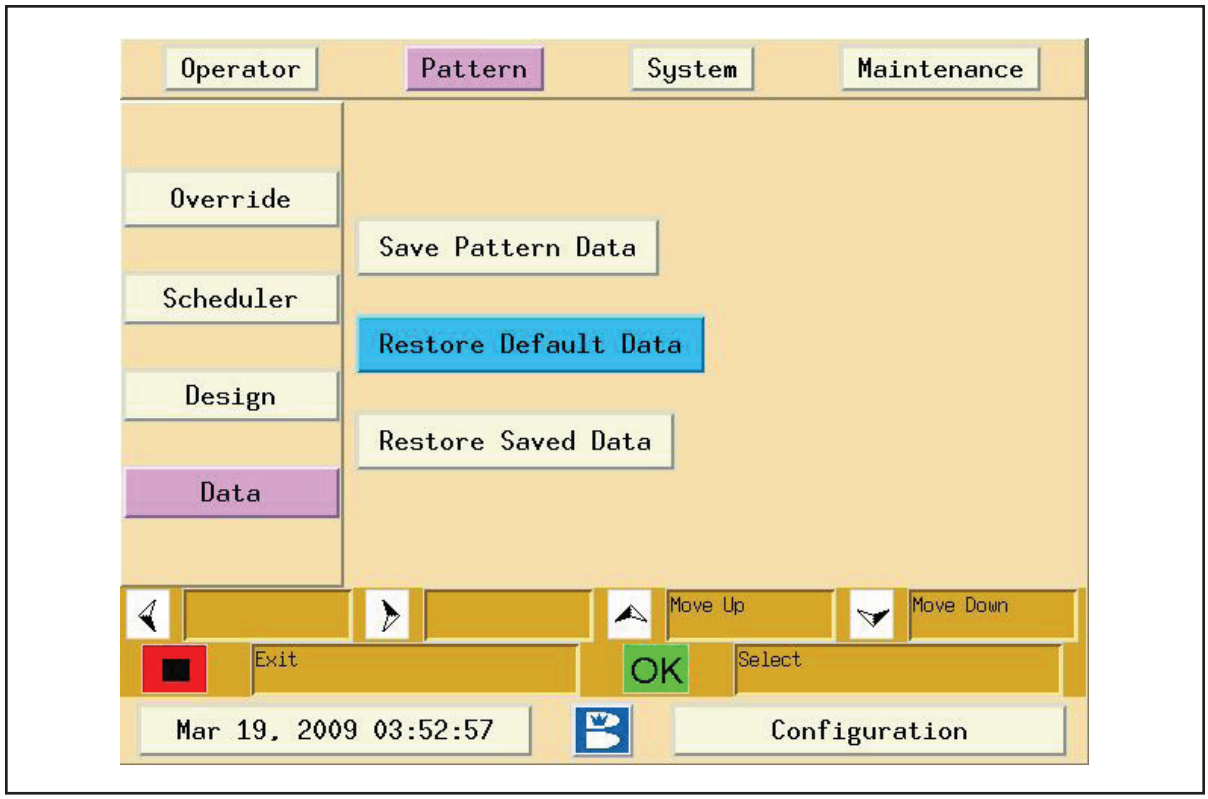


Figure 5-15. Restore Default Data Screen

NOTE: *The default Pattern Data cannot be changed. This function will always restore the 10 starting patterns that were set in the factory. Refer to Figure 5-15*

Backing Up and Importing Data

The GUI is designed with a USB port that allows you to connect a USB flash drive for importing or exporting data.

Backing Up Your System

It's important to back up the data in your machine regularly to prevent loss of information. You can backup most data on the Envoy to an external drive using the USB port on the control box. This capability lets you back up most information on the system in one step. You can save up to five previous system backups. You can backup this data on a PC computer by using the USB flash drive to transfer the data into the PC USB port.

To backup your system:

1. Plug a USB flash drive into the GUI's USB port. The Import/Export screen appears.
2. Use the left/right arrows to select "export" and press "OK."
3. Use the up/down arrows to select the backup folder you want to save to and press "OK" to start the backup.

NOTE: *Only the 10 patterns in the active GUI memory are saved when you backup or export data to the USB flash drive.*

CAUTION! Never remove the USB flash drive from the USB port if the light on the drive is still flashing. Doing so could damage the file system on the USB flash drive. When the text on the GUI returns, it is safe to remove the USB flash drive.

Importing Data

You can also import data via the USB port (except for machine-specific data like name of center, date of installation, etc.). This may be helpful if you've had a system problem and want to restore your settings from a previously saved backup.

NOTE: *This operation will replace the 10 current patterns in active GUI memory, schedules and PINs with older data saved on the USB flash drive. You may want to backup the 10 patterns in active memory as explained above before you import new data. This function saves the entire system data, including the PIN ID number, Pattern Scheduler, Conditioner Selection and Maintenance Logs. Do not import backup data from another center unless you know their PIN ID numbers and intend to change your entire system data file.*

To import data:

1. Plug in the USB flash drive into the GUI's USB port. The Import/Export screen appears.
2. Use the right/left arrows to select "import" and press "OK."
3. Use the up/down arrows to select the backup folder you want to import and press "OK" to import the files. If there are no backups available, the backup folders will appear grayed out.

CAUTION! Never remove the USB flash drive from the USB port if the light on the drive is still flashing. Doing so could damage the file system on the USB flash drive. When the text on the GUI returns, it is safe to remove the USB flash drive.

THE SYSTEM SCREEN

NOTE: *This screen may be PIN protected.*

About the System Screen

The system menu provides basic information about the bowling center and the machine, and provides a security function to control access to different machine functions. Refer to Figure 5-16.

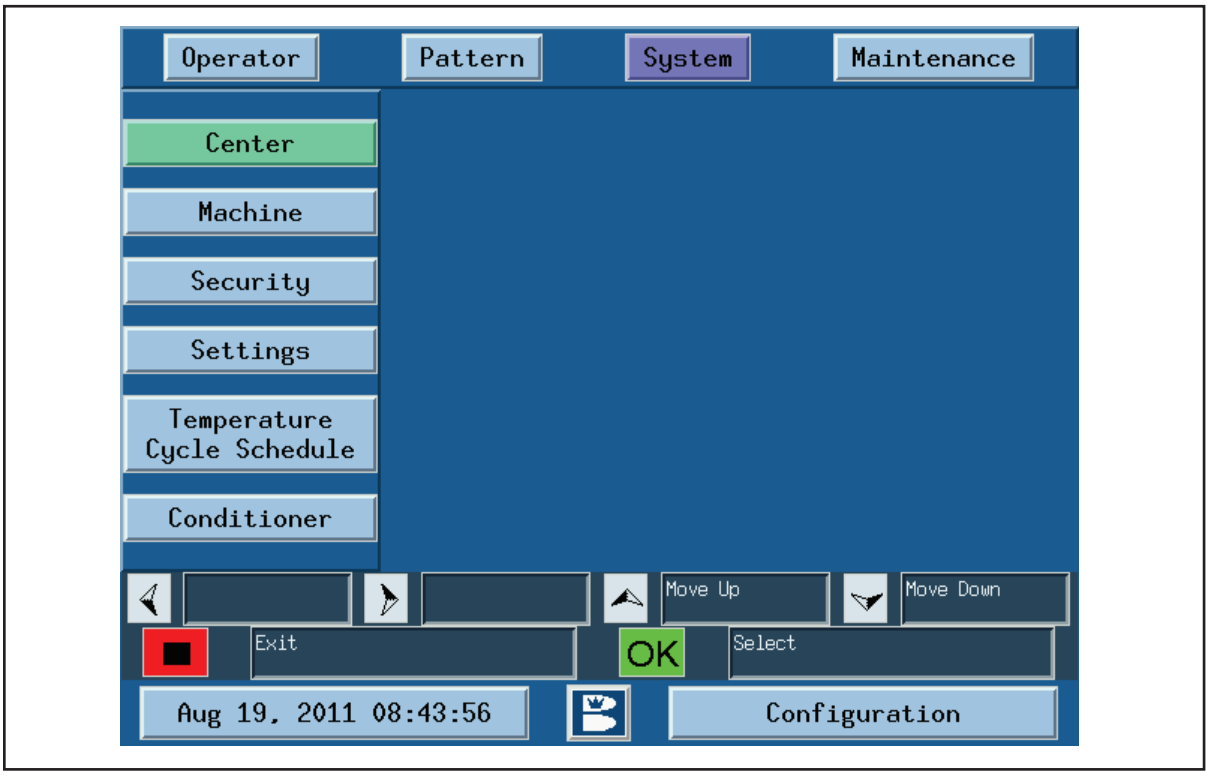


Figure 5-16. System Screen

Center displays the name of the bowling center and the total number of lanes.

Machine displays the date of manufacture and installation, the serial number, and the specifications for the controller and interface.

Security lets you control who has access to the machine's operation and programming.

Settings lets you change the date, time, language, and start distance from the foul line.

Temperature Cycle Scheduler lets you start heating the oil prior to starting the lanes.

Conditioner lets you select the brand of conditioner used in the machine.

System Center

The "Center" screen allows you to enter the name and number of bowling lanes in the center. It is very important to have the correct number of lanes if you are using the scheduler option. Refer to Figure 5-17.

NOTE: *A Certified Brunswick installer will set up this screen with the name of your center and the number of lanes.*

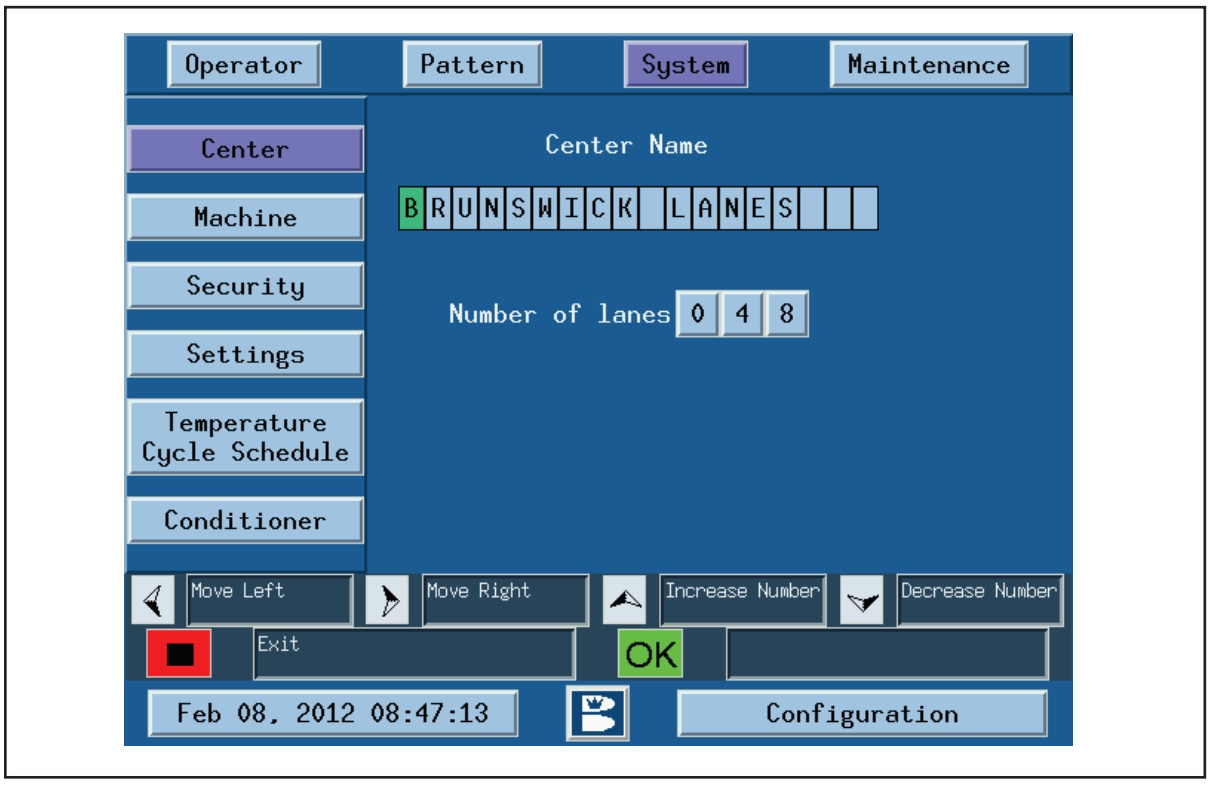


Figure 5-17. System Center

Entering the Name of Your Bowling Center

1. Go to the System menu.
2. Select “Center” & press “OK”.
3. Use the left/right arrows to navigate through the center name.
4. Use the up/down arrows to select a letter, number, or space.

Entering the Number of Lanes

1. Use the left/right arrows to navigate to “Number of lanes”.
2. Use the up/down arrows to enter the number of lanes in your center.

IMPORTANT!: *If you change the number of lanes after initial setup, you may have to update your pattern scheduler (the pattern scheduler uses the number of lanes entered here in establishing schedules).*

3. Press “exit” to save and return to the previous screen.

System Machine

The machine screen displays machine information, such as the GUI software and machine control firmware versions, the serial number and ID number of the GUI, date of manufacturing and the date of installation (set by your installer). This information will be required by our Customer Response Center to track the history of the lane machine. Refer to Figure 5-18.

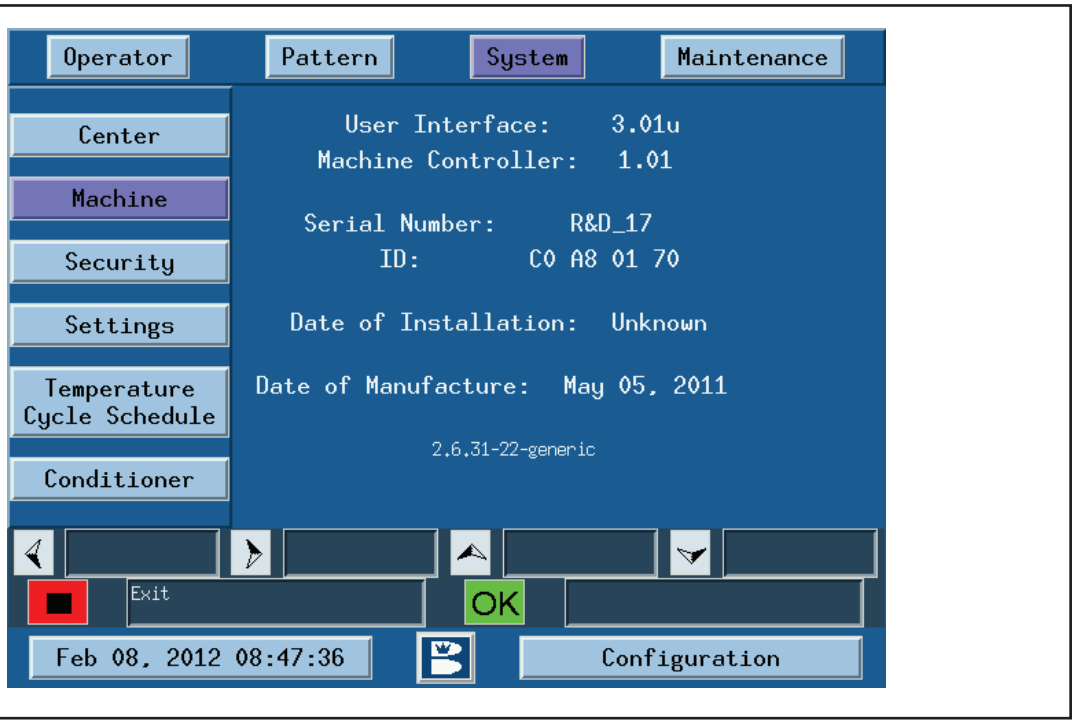


Figure 5-18. System Machine

Accessing Basic Identifying Information About Your Machine

1. Go to the System menu.

2. Select “Machine” & press “OK”.

3. This screen displays the serial number of your GUI, the software version of the **User Interface** and **Machine Controller**, the date of manufacture, the date of installation, and other general information.

System Security

The system security on the Envoy enables you to safely protect your critical machine settings from unwanted access. When completely enabled, the machine will track every action taken by a user during the time they are logged in.

Setting Up PINs

Information in the Pattern, System, and Maintenance menus can be protected from unauthorized access by setting up to 10, 4 digit PINs (personal identification numbers) for different users. The ten ID numbers (1-10) will display a status for each position.

ID number zero (0) is used to enable a “Log-in” feature that requires a four digit access code prior to being able to access the operators screen. A user with a valid PIN number is allowed to log-in and accountability during that session will be assigned to that user. The pattern change log and the pattern run log will assign the users name for each action taken during operation. Users not assigned PIN numbers will be restricted from viewing or operating the GUI and lane machine.

If you do not assign PINs, all users will have access to all operations and menus.

If you assign PINs, each user can also be assigned a security level that determines which machine functions and menus he or she can access. You can choose between 2 security levels:

Level 1 is generally for machine operators. It allows the user to run lanes, and it allows access to the pattern override function and most maintenance menus. Menus that may affect the performance of a conditioning pattern will be restricted in this security level.

Level 2 is generally for managers or mechanics. It allows the user access to all screens, menus, and operations.

If, for any reason you lose your PIN and need access to the machine, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com. We will assign you a temporary PIN and help you with the reset process.

Figure 5-19. System Security

To Set a PIN

1. Go to the System menu. Refer to Figure 5-19.
2. Select “Security” & press “OK”.
3. Use the up/down arrows to select an ID number (0 is always the login PIN).
    a. To enter a new PIN, select an “empty” ID number.
4. Use the left/right and up/down arrows to create a 4 digit PIN.
5. Select a security level.
    a. 1 = Operator – Pin number provides access to pattern override and some maintenance menus only.
    b. 2 = Manager/Mechanic level – pin number provides access to all functions and systems.
6. Enter a user name for this pin number.
7. Use the left/right arrow to navigate to “Set PIN”.

NOTE: *If the PIN is already assigned to a different user (ID) a warning message will indicate that you must enter a different number.*

NOTE: *Once PIN is set, the status line will display "assigned" (instead of "empty") and the 4 digit PIN will display as all zeroes for security reasons.*

8. Press "exit" to save and return to the previous screen.

Changing PINs

1. Go to the System menu.
2. Select "Security" & press "OK".
3. Use the right/left arrows to navigate to PIN.
4. Use the up/down arrows to change the PIN number.
5. Press "exit" to save and return to the previous screen.

NOTE: *Updating the user ID requires you to also change the PIN number.*

Resetting PIN Access

NOTE: *You can reset the PIN security if you want all users to have access to all information*

1. Go to the System menu.
2. Select "Security" & press "OK".
3. Navigate to "Reset All" and press "OK".
4. Press "exit" to save and return to the previous screen.

System Settings

The system settings are used to set clock functions like the date, time, and date format (MM/DD/YY or DD/MM/YY). The Temperature Cycle allows the user to turn on or off the oil heating features of the Temperature Cycle Scheduler. (You can still over-ride this from the Operators screen.) The operator can select their preferred language and whether to see units of measure expressed in Imperial (US) or Metric (International). The default start distance from the foul line must be selected, so no pattern may be set to apply conditioner between this setting and the foul line. The operator will also determine the vacuum forward start distance and return ending distance for maximum sound reduction and power savings. The end of lane delay will allow the squeegee to delay lifting long enough to wipe on the tail plank of the lane as the machine returns, this will prevent cleaner drips from forming on the squeegee blade.

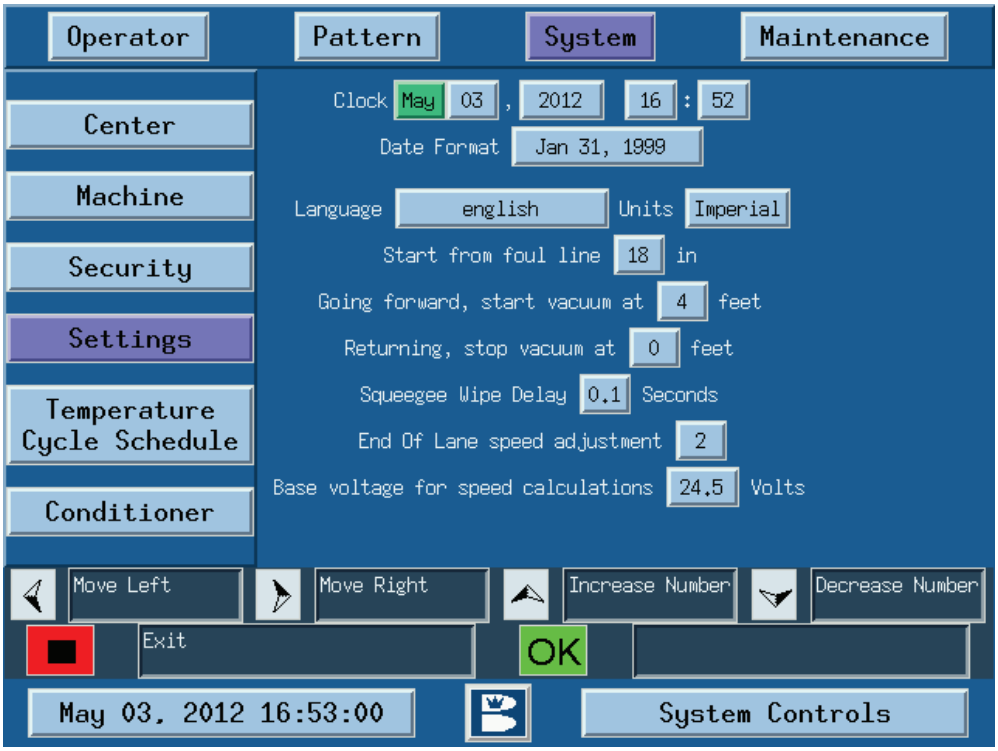


Figure 5-20. System Settings

Changing the Date and Time

1. Go to the System menu.
2. Select “Settings” & press “OK”.
3. Use left/right arrows to navigate to “Clock”.
4. Use up/down arrows to change month/date/time.
5. Press “exit” to save and return to the previous screen.

Changing the Date Format

1. Go to the System menu.
2. Select “Settings” & press “OK”.
3. Use left/right arrows to navigate to “Date Format”.
4. Use up/down arrows to select the format you prefer.
5. Press “exit” to save and return to the previous screen.

Changing the Language

1. Go to the System menu.
2. Select “Settings” and press “OK”.
3. Use the left/right arrows to navigate to “Language”.
4. Use the up/down arrows to select from the list of languages.
5. Press “exit” to change the language and return to the previous screen.

Changing the Units of Measure (Imperial vs. Metric)

NOTE: *You can change from Imperial to Metric units of measure. If you do so, all units of distance and temperature that appear on the GUI will be converted to the new standard.*

1. Go to the System menu.
2. Select “Settings” and press “OK”.
3. Use the left/right arrows to navigate to “Units”.
4. Use the up/down arrows to switch between Imperial and Metric units.
5. Press “exit” to save and return to the previous screen.

Changing the Conditioner Start Distance from the Foul Line

IMPORTANT!*: For bowler safety, you should not start dispensing oil at the foul line. You can set the start distance from the foul line in increments of 6’ (152mm) between 6 and 24 inches (15.24 to 60.96 cm). 6” (152mm) is the minimum value and no pattern may start closer to the foul line than the value selected in this box.*

1. Go to the System menu.
2. Select “Settings” and press “OK”.
3. Use the left/right arrows to navigate to “Start from foul line”.
4. Use the up/down arrows to change the start distance.
5. Press “exit” to save and return to the previous screen.

Vacuum Motor ON/OFF Controls

The vacuum motor can be controlled from the System Settings menu to delay starting the vacuum, going forward until a set distance from the foul line. The default is 3 ft to allow excess from the cleaner pulse not to be immediately removed until just before the first synthetic panel joint. You can also Stop the Vacuum Early, while returning to the foul line at a set distance. This will reduce power consumption from the battery. The default setting of 0 ft doesn't shut the vacuum off until the machine returns to the foul line.

1. Go to the System menu
2. Select "Settings" and press "OK"
3. Use the left/right arrows to navigate to "Going forward, start vacuum at"
4. Use the up/down arrows to increase or decrease the start distance
5. Use the left/right arrows to navigate to "Returning, stop vacuum at"
6. Use the up/down arrows to increase or decrease the ending distance
7. Press "Exit" to save and return to the previous screen

Squeegee Wipe Delay

The next new System Settings option allows you to delay lifting the squeegee at the end of lane (EOL). An EOL delay of ~0.5 seconds will cause the squeegee lift to delay just enough for the point of the "V" to contact the tail plank, wiping off any residual moisture. A longer delay will increase the squeegee wipe while a setting of zero will assure that the squeegee always lifts before contacting the tail plank.

1. Go to the System menu
2. Select "Settings" and press "OK"
3. Use the left/right arrows to navigate to "End of Lane Delay"
4. Use the up/down arrows to select the desired delay amount
5. Press "exit" to save and return to the previous screen

Base Voltage for Speed Calculations

The total time of the Envoy to run a lane is the best indication of any need to change the "*Base Voltage for Speed Calculations"* adjustment. This adjustment affects all the machine travel speeds so it should be checked before making any End of Lane Speed Adjustments. Run at least one lane to allow the system to balance the battery voltage before measuring the time to run a lane (from pressing the start button to the machine stopping at the foul line). The measured time should fall into the following ranges:

62-72 seconds in Quick Clean
70-80 seconds in Heavy Clean
78-88 seconds in Max Clean

The default value is 24.0 volts. Each 0.5 volt adjustment increase will speed up the Envoy by ~1.5 seconds per lane run and each 0.5 volt adjustment decrease will slow down the Envoy by ~1.5 seconds. The maximum adjustment value is 27.0 volts and the minimum value is 21.0 volts. Use the following steps if your measured your time to run each lane falls outside of the expected ranges

1. Go to the System menu

2. Select "Settings" and press "OK"

3. Use the left/right arrows to navigate to "Base Voltage for Speed Calculation"

4. Use the up/down arrows to increase or decrease Base Voltage (resulting in an increase or decrease of ALL speeds)

5. Press "exit" to save and return to the previous screen

End Of Lane Speed Adjustment

The "*End of Lane Speed Adjustment"* affects only the last 12" of travel in the pin deck. The best indication of any needed change in this adjustment is if the Envoy ever stalls before it reaches the end of the lane (too slow) or if it runs off the end of the pin deck (too fast). Because the pinsetter blocks the view, it can be difficult to determine why the machine has stopped in the pin deck. The best indicator is to watch the machine travel as it gradually slows down at the end of the lane and compare where the Envoy rear cover is positioned in relation to the pin spots. The Envoy rear cover should normally travel approxiamately 2" past the 2-3 pin spots when it stops and reverses direction.

- Envoy stops before the rear cover has traveled past the #1 pin spot
  - Increase the Base Voltage for Speed Calculation in 0.5 volt increments. This will increase all travel speeds so the momentum of the machine will move it into the zone where the End of Lane Speed Adjustments will take over (The End of Lane Speed Adjustment will not have any affect when the machine doesn't reach the last 12" of travel in the pin deck.)

- Envoy stops after the rear cover has traveled past the #1 pin spot, but before the rear cover has traveled ~2" past the 2-3 pin spots
  - Increase the End of Lane Speed Adjustment in steps of +4 until the machine makes it through the pin deck without stalling. This will increase the speed in the last 12" of travel in the pin deck to overcome any resistance that is causing it to stall (such as excess pin deck friction or stick down OOR spots).

- Envoy stops after the rear cover has traveled more than 4" past the 2-3 pin spots
  - The traction drive wheels have traveled past the end of the pin deck and you will need to decrease the End of Lane Speed Adjustment in steps of -4 until the machine stops ~2" past the 2-3 pin spots and reverses direction before the traction drive wheels travel past the end of the tail plank. This will decrease the speed in the last 12" of travel in the pin deck.

The default value for the End of Lane Speed Adjustment is 0. It can be adjusted to a maximum value of +15 or a minimum value of -15. When you have time, it is best to balance the End of Lane Speed Adjustment between the upper and lower limits to reduce the risk of any "borderline" adjustment.

- Find the upper limit by increasing the End of Lane Speed Adjustment in steps of +2 until the Envoy traction drive wheels have travel past the end of the pin deck. (This value is normally between +5 and +15.)

- Find the lower limit by decreasing the End of Lane Speed Adjustment in steps of -2 until the Envoy stalls before the rear cover has traveled ~2" past the 2-3 pin spots. (This value is normally between -5 and -15.)

- **Set the final End of Lane Speed Adjustment value halfway between the upper and lower limits found above**. It is normal to have a 20 point spread between the upper and lower limits (for example, if the lower limit was -8 and the upper limit was +12, then the final value should be set to +2).

NOTE: *If the Envoy stops under the pin deck, it is easy to have the machine finish its travel back to the foul line. Initiate this by pressing the green OK button on the T-handle, pull or push the Envoy to position the rear cover ~2" past the 2-3 pin spots and make sure you are able to get out of the way as the Envoy reverses direction and returns to the foul line.*

It is best to balance the End of Lane Speed Adjustment with a fully charged battery. Then continue to run the machine for the remaining lanes to assure that it runs through all the pin decks without any issues. It may be necessary to make slight adjustments to this balanced End of Lane Speed Adjustment (either up or down) if you notice any uncharacteristic lane that the lane machine is at risk of stalling or running past the end of the pin deck. Contact BTS if you experience a smaller than normal range between the upper and lower limits or experience inconsistent results with these adjustments.

Use the following steps if it is necessary to change the End of Lane Speed Adjustment:

1. Go to the System menu
2. Select "Settings" and press "OK"
3. Use the left/right arrows to navigate to "End Of Lane Speed Adjustment"
4. Use the up/down arrows to increase or decrease End of Lane Speed speed
5. Press "exit" to save and return to the previous screen

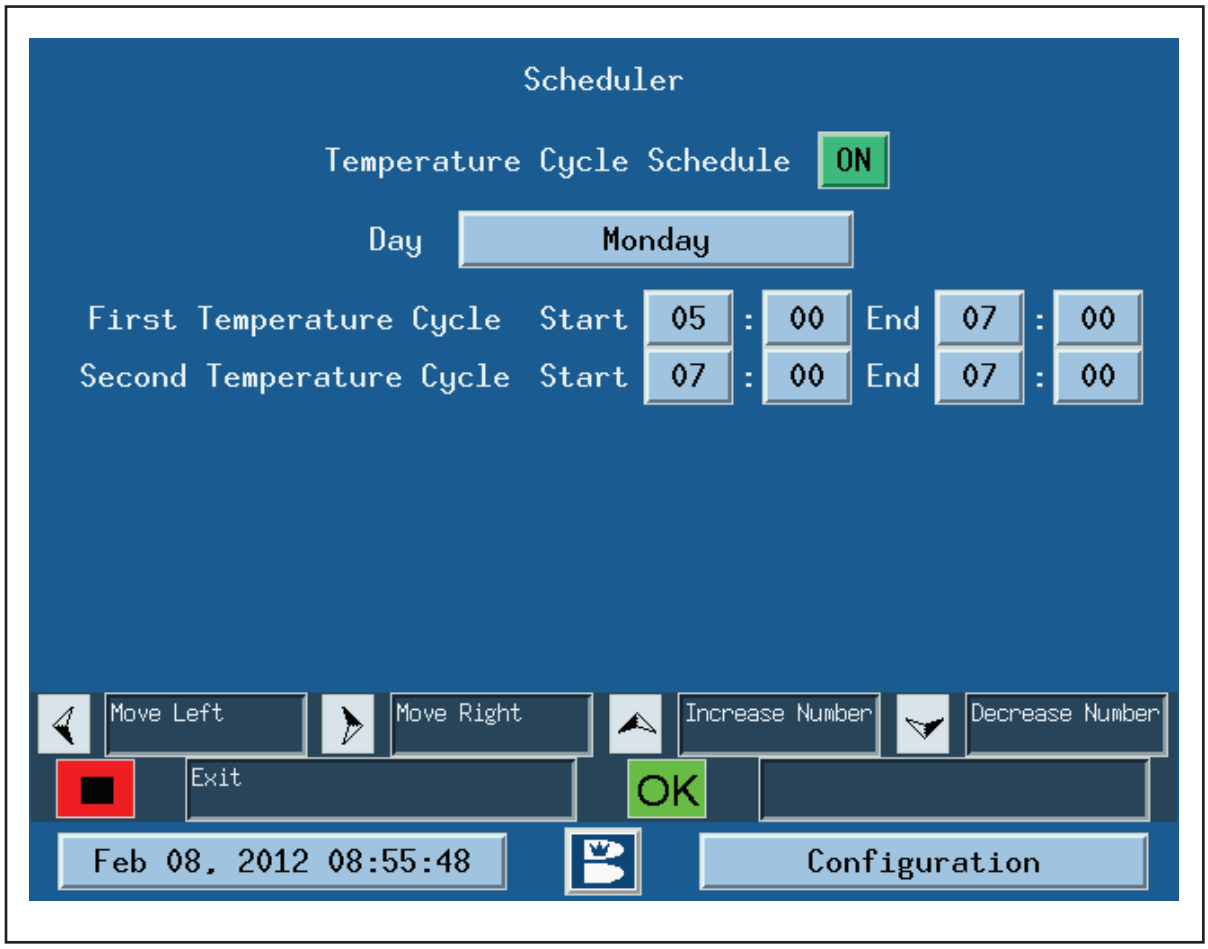


Figure 5-21. Conditioner Temperature Cycle Scheduler

Temperature Cycle Scheduler

The scheduler for the temperature cycle will allow you to automatically turn the conditioner heat cycle ON and OFF at specific times each day of the week. This will allow for the conditioner to be at a consistent temperature when applied to the lane surface. Since this feature adds to the power consumption of the machine, it is recommended that you schedule these cycle times to be ON prior to conditioning the lanes – while the battery charger is still connected. This will use the batter charger power to heat the conditioner. During the conditioning cycle on the lanes, the running of the conditioner pump is sufficient to maintain the conditioner temperature without using the heater feature.

NOTE: *A caution will appear on the GUI near the Temperature Cycle Box if you continue to leave the Temperature Cycle ON while conditioning the lanes.*

1. Go to the System menu
2. Select “Temperature Cycle Schedule” and press “OK”
3. Use the left/right arrows to navigate to “Temperature Cycle Schedule”
4. Use the up/down arrows to select between “On” and “Off”

5. Use the left/right arrows to select the time periods and set the schedule

6. Press “Exit” to save and return to the System Settings screen

7. Press “Exit” to save and return to the previous screen

NOTE: *The conditioner Temperature Cycle can be run while the Envoy is in the transport position. This feature was added to allow the conditioner heat cycle to be used while the battery charger is still connected to the machine.*

NOTE: *The conditioner Temperature Cycle can also be manually changed between ON and OFF from the Operators Screen.*

1. Press the left arrow key until the Temperature Cycle box is highlighted

2. Press the green “OK” button to toggle between ON and OFF

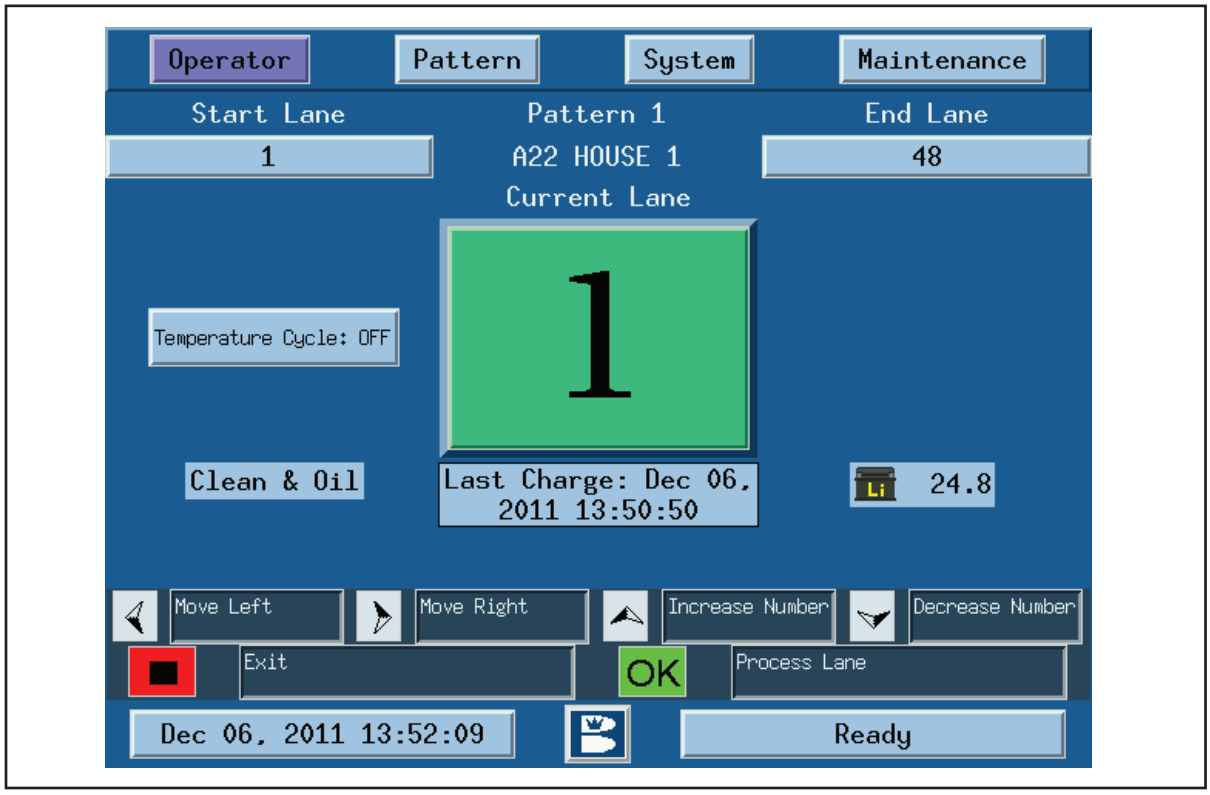


Figure 5-22. Temperature Cycle Scheduler

Conditioner

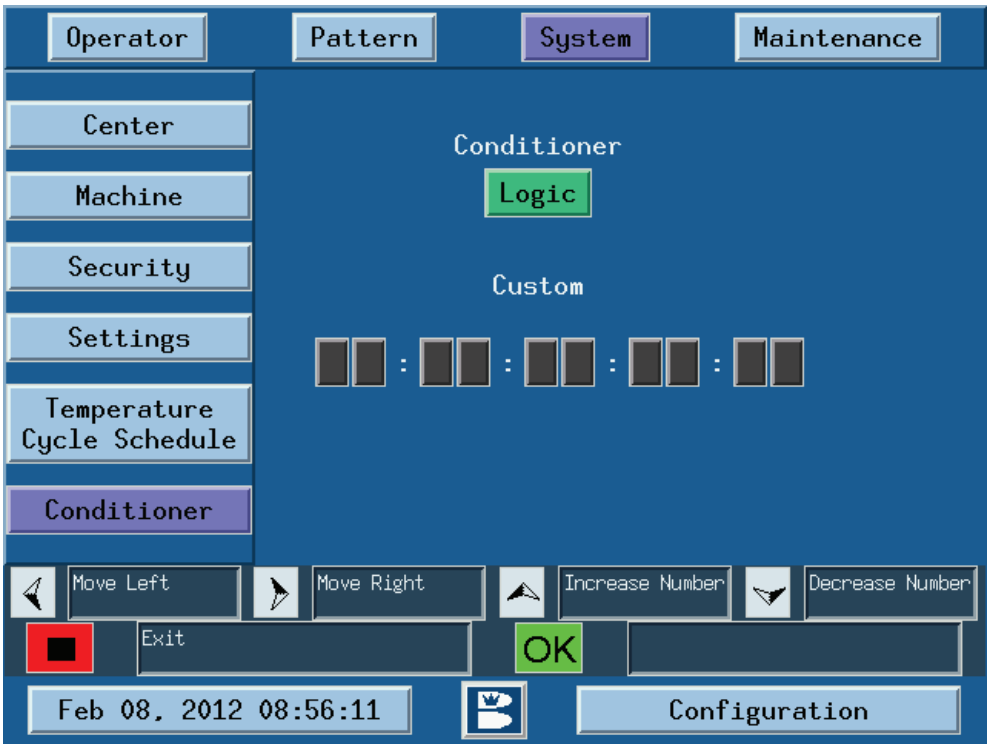


Figure 5-23. Conditioner

Changing Conditioner

NOTE: *If you change conditioners, you must identify the brand of conditioner you are using to ensure proper operation. Different conditioners have different flow rates, which may require the machine to recalculate conditioner patterns. If your brand is not listed, select "Custom" and please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com, to get the flow values for that brand.*

1. Go to the System menu. Refer to Figure 5-23.
2. Select "Conditioner" and press "OK".
3. Use the up/down arrows to select the conditioner brand.
4. Press "exit" to save and return to the previous screen.

NOTE: *Selecting a different conditioner will require the download of all patterns.*

THE MAINTENANCE SCREEN

NOTE: *This screen may be PIN protected.*

About the Maintenance Screen

The maintenance screen provides information about the long-term use and maintenance of the machine. Refer to Figure 5-24.

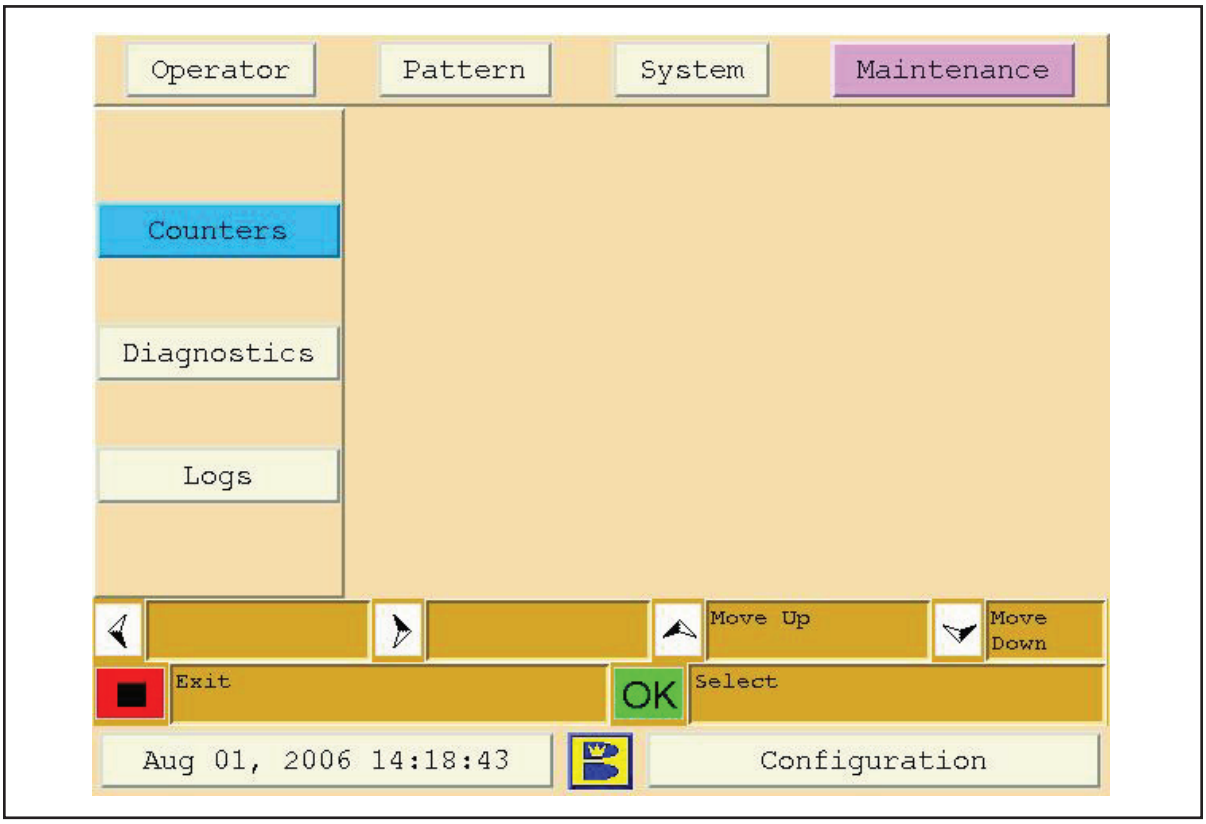


Figure 5-24. Maintenance

Counters display the total lanes run, the amount of use on a variety of replaceable parts, and alerts you when a part is reaching the end of its useful life. These will generate a warning message when the counter expires. The maintenance message will continue to appear before running each lane until the counter is reset.

Diagnostics shows the current state of all major hardware devices and allows you to cycle motors on and test sensors and switches for troubleshooting purposes.

Logs keeps and displays records of pattern changes, patterns run, maintenance, and error messages.

Maintenance Counters

The Envoy monitors the life of consumable items that will need periodic replacing or cleaning. Life expectancy of most items are based on the number of lanes they will perform. Motors are monitored in the number of hours they are used. After you replace a part, you must reset the counter for that part to start the counter for the new part (the duster cloth counter will reset automatically if the duster cloth is changed during a running session via the “change duster cloth” button in the Operator’s Screen). A list of the counter values is shown in section 7.

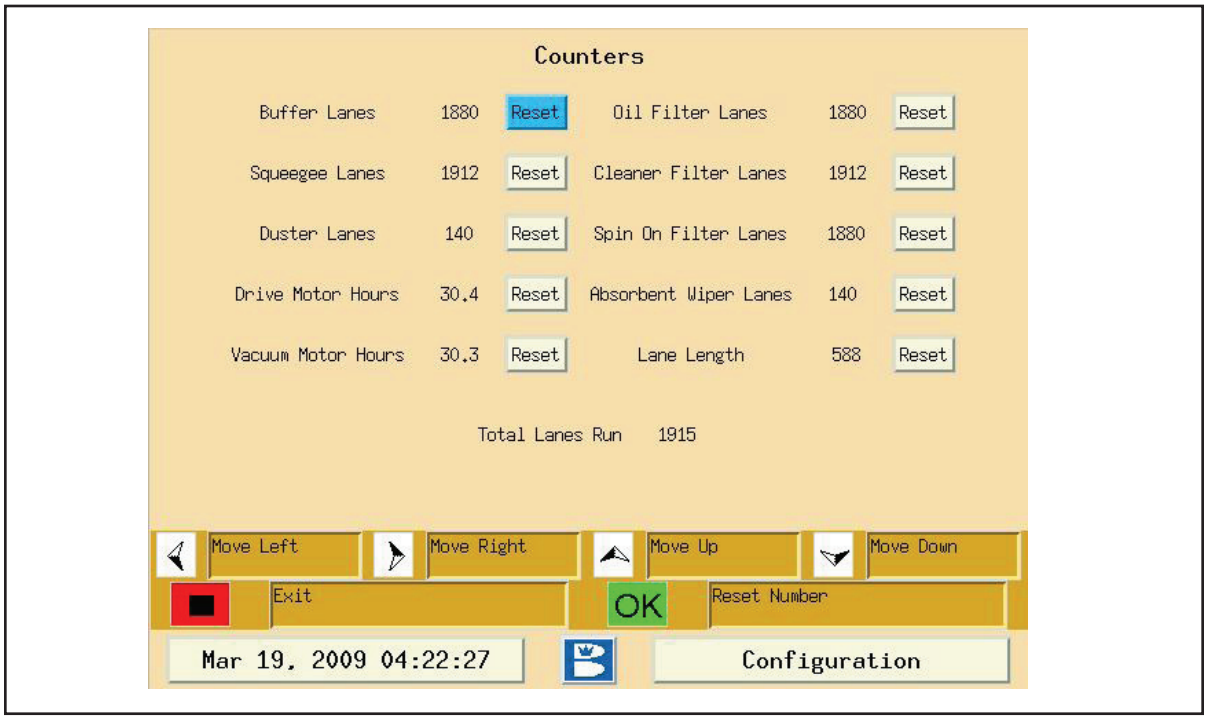


Figure 5-25. Maintenance Counters

Viewing and Resetting Counters

1. Go to the Maintenance menu. Refer to Figure 5-25.
2. Select “Counters” and press “OK”.
3. Use the up/down arrows to navigate to the counter to be reset and press “OK”.
4. The counter will reset the number of lanes to “0” on the item you select.
5. Press “exit” to save changes and return to the previous screen.

NOTE: *Changes will not be saved until screen is exited. Be sure that you select the correct counter before pressing reset.*

NOTE: *You can’t reset the counter for Total Lanes Run.*

Maintenance Diagnostics

This menu allows you to operate the pumps and motors and test the operation of sensors and switches. Diagnostics is an invaluable function for troubleshooting machine problems. *Refer to Section 6.0 Troubleshooting for more information*. Refer to Figure 5-26.

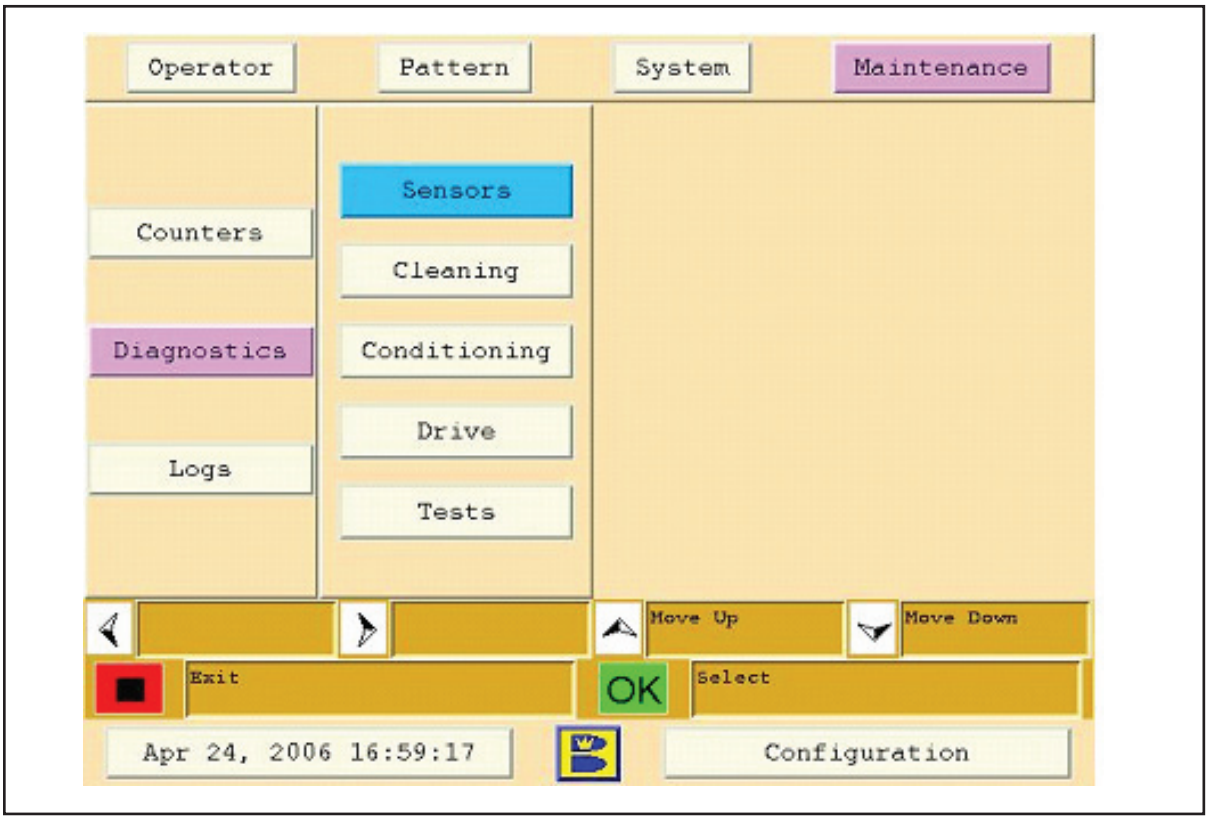


Figure 5-26. Maintenance Diagnostics

Sensors

This menu lets you view the current status of all sensors or switches for diagnostic purposes. Refer to Figure 5-27.

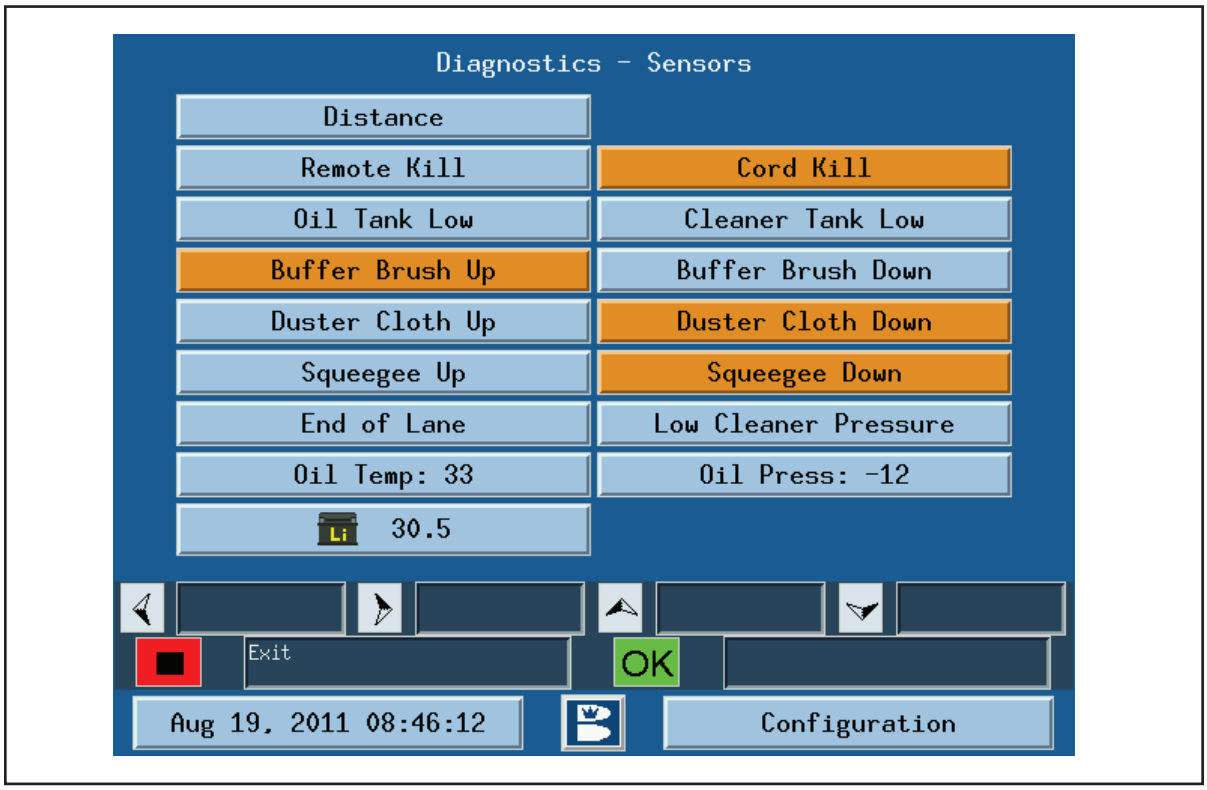


Figure 5-27. Diagnostics Sensors

1. Go to the Maintenance menu.
2. Select “Diagnostics” and press “OK”.
3. Use the up/down arrows to navigate to “Sensors” and press “OK” to see the machine sensors.
4. If a sensor is active or “on,” it will be highlighted in color.
5. Some sensors can be physically activated.

Cleaning

This menu lets you view the current status of all sensors or switches, and view or test all motors in the cleaning system. Refer to Figure 5-28.

Figure 5-28 Diagnostics Cleaning

To view a cleaning system sensor position or test a motor function:

1. Go to the Maintenance menu.
2. Select “Diagnostics” and press “OK”.
3. Use the up/down arrows to navigate to “Cleaning” and press “OK”.
4. To check sensors, review the list of sensors on the upper half of the screen. If a sensor is active or “on,” it will be highlighted in color.
5. To test the motors, valves, and pumps of the cleaning system, review the list on the lower half of the screen. You can turn each device off or on for a limited period of time for diagnostics or maintenance purposes.

Conditioning

This menu lets you view the current status of all sensors or switches, and view or test all motors in the conditioning system. Refer to Figure 5-29.

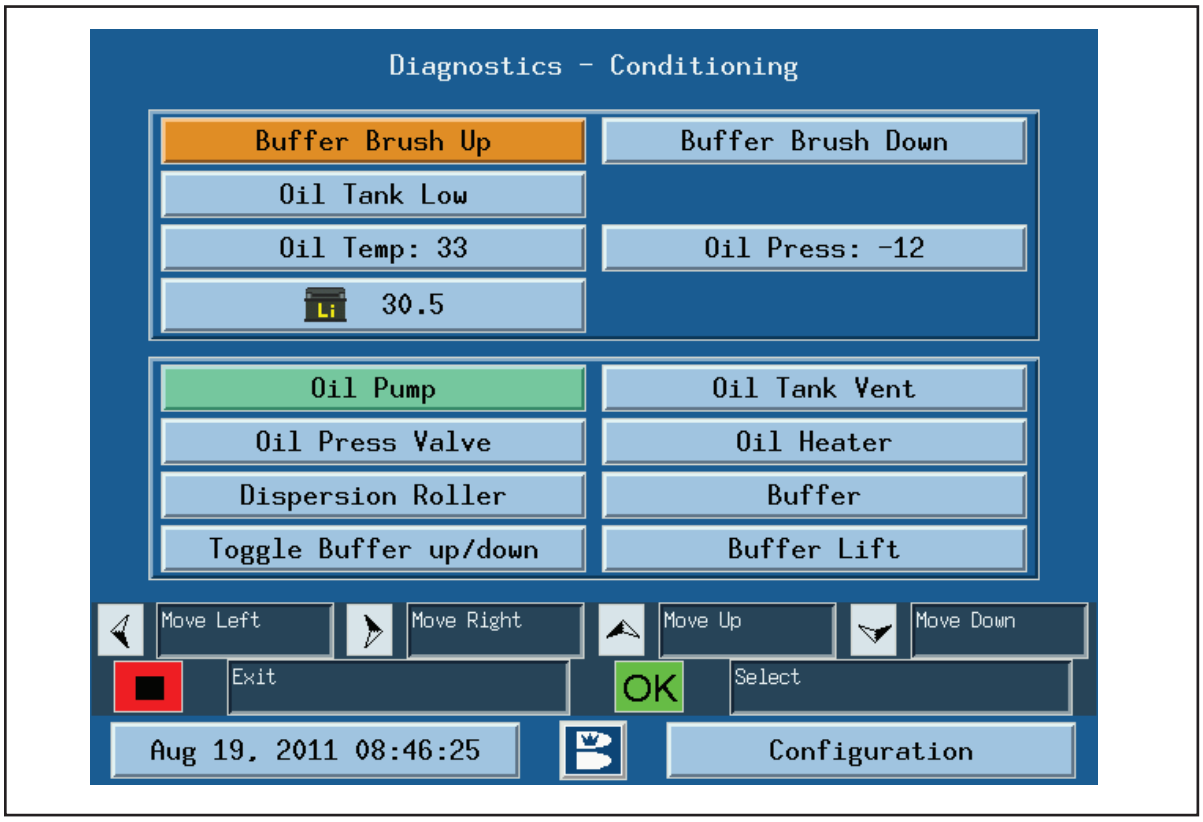


Figure 5-29. Diagnostics Conditioning

To view a conditioning system sensor position or test a motor function:

1. Go to the Maintenance menu.
2. Select “Diagnostics” and press “OK”.
3. Use the up/down arrows to navigate to “Conditioning” and press “OK”.
4. To check sensors, review the list of sensors on the upper half of the screen. If a sensor is active or “on,” it will be highlighted in color.
5. To test the motors, valves, and pumps of the conditioning system, review the list on the lower half of the screen. You can turn each device off or on for a limited period of time for diagnostics or maintenance purposes.

Drive

This menu lets you view the readings of the distance encoder (labeled “Distance”) and test the drive mechanism in forward and reverse. Refer to Figure 45-30

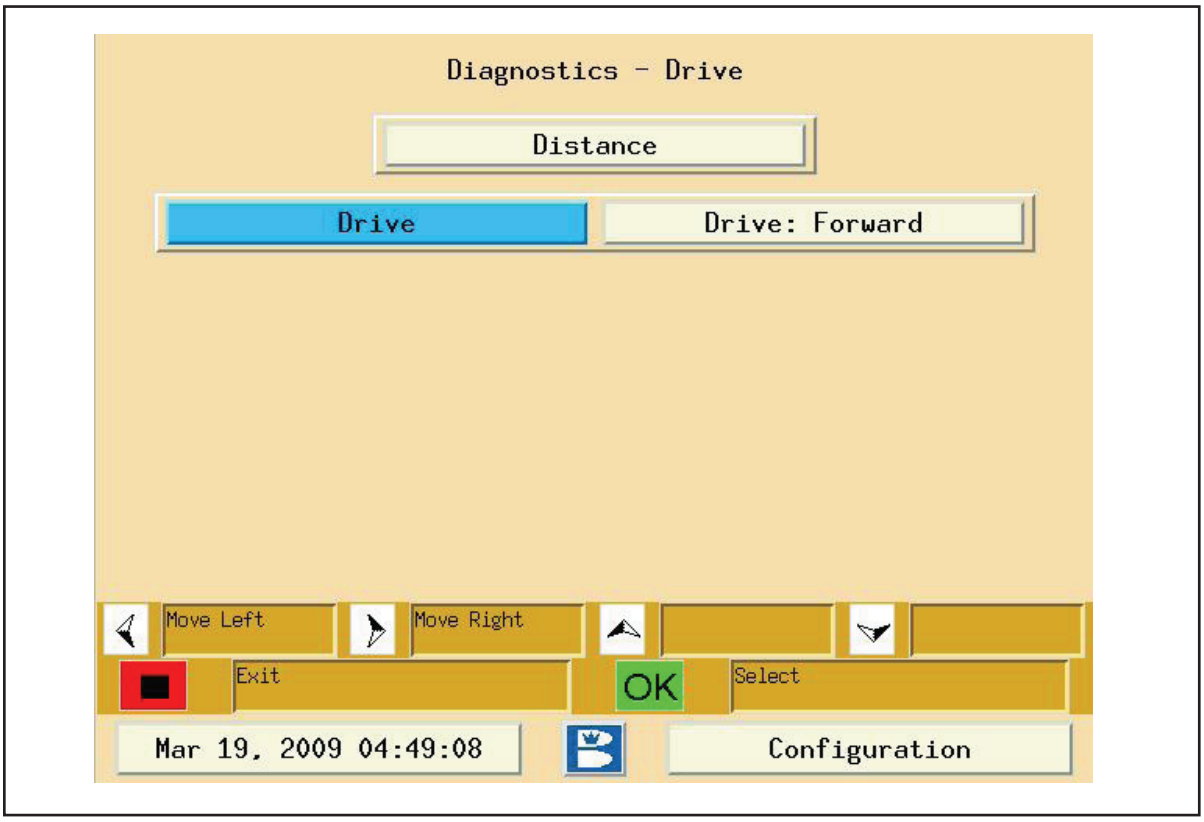


Figure 5-30. Diagnostics Drive

To view the drive system sensor position or test a motor function:

1. Go to the Maintenance menu.
2. Select “Diagnostics” and press “OK”.
3. Use the up/down arrows to navigate to “Drive” and press “OK” .
4. To test the distance encoder, manually spin the rear shaft. The screen will display the activation of the encoder sensor in the “Distance” box.
5. To test the drive mechanisms, select between “Drive: Forward” or “Drive: Reverse” and then select “Drive” to test the forward or reverse drive systems.

Tests

The Tests diagnostics function allows the user to perform specific tests on the injectors to verify that all injectors are firing properly and to test the cleaner spray coverage, on the lane, at maximum (25-30 psi) and minimum (20-25 psi) pressures. Refer to Figure 5-31.

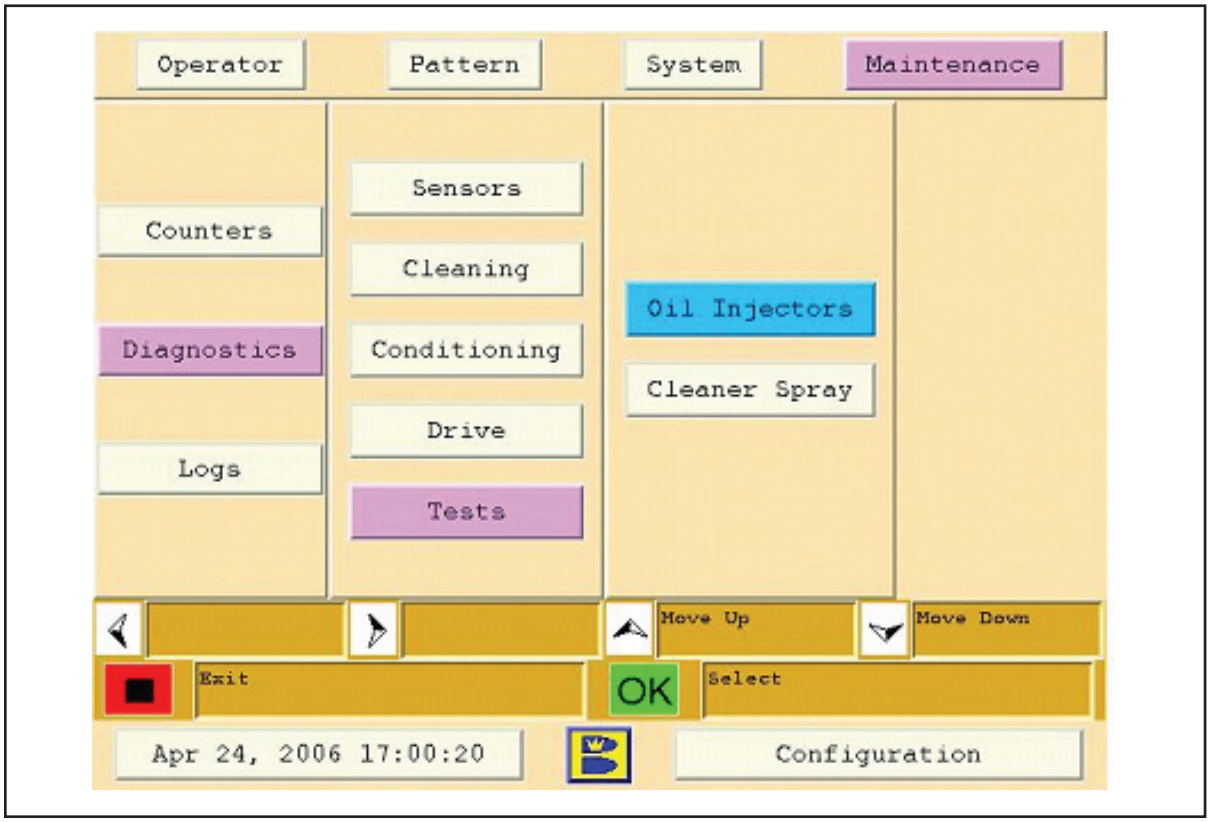


Figure 5-31. Diagnostics Tests

Oil Injector Test

The test for the Oil Injectors is designed for the technician to visually see each injectors spray pattern. This diagnostic function verifies that each injector is firing properly and to identify if an injector has failed or not creating the appropriate spray pattern. The machine will travel approximately 25 feet down the lane during this test. The process includes cleaning the lane and firing each injector in a sequential order allowing the technician to easily see each injection without interference by the buffer brush.

To test the Oil Injectors on the lane:

1. Go to the Maintenance menu.
2. Select “Diagnostics” and press “OK”.
3. Use the up/down arrows to navigate to “Tests” and press “OK”.
4. Select the Oil Injector test, press “OK” and the following screen will appear (“Oil Injector” will appear at the top of the screen for the injector test). Refer to Figure 5-32.

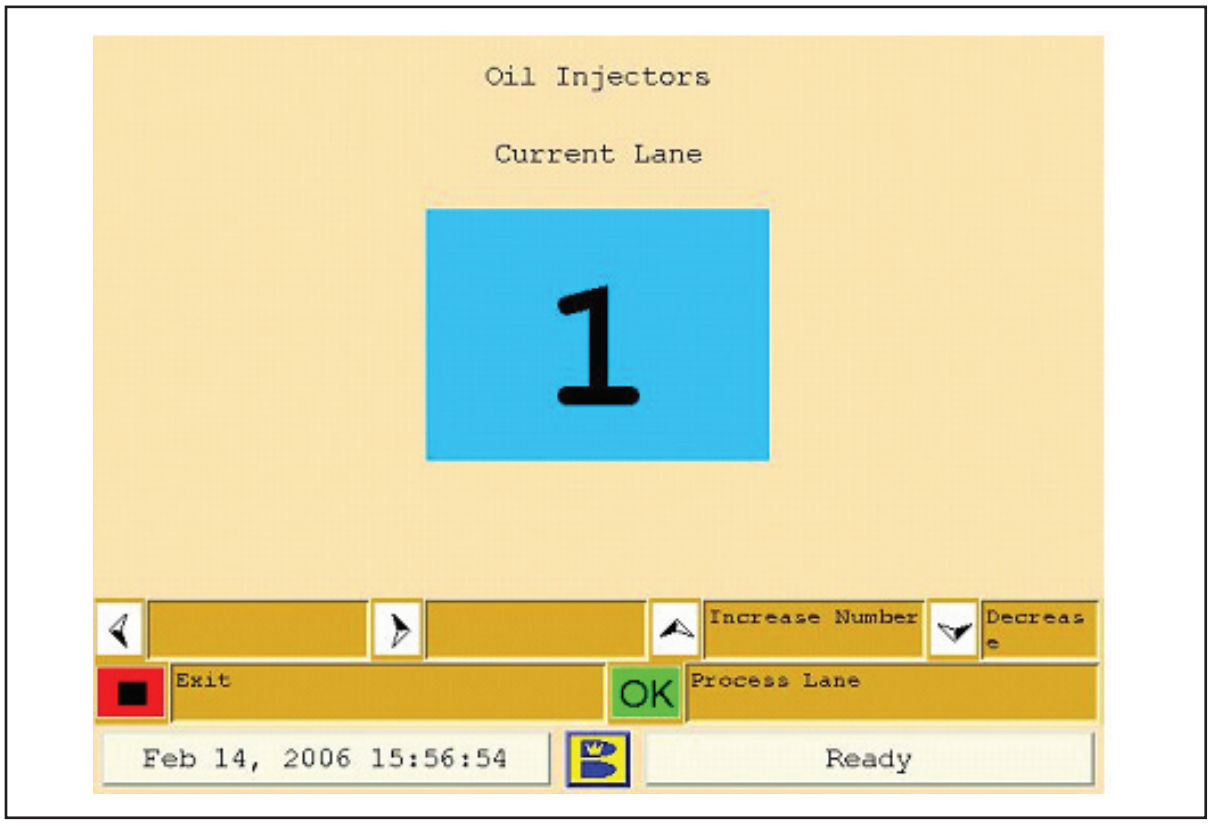


Figure 5-32. Oil Injectors

5. Press “OK” to prepare the machine for operation. This may require a pattern download.
6. Put the lane machine on the lane when the message appears.
7. Press “OK” to start the test.

NOTE: *The machine will automatically clean approximately the first 25 feet of the bowling lane and inject at the same time while performing this test. Perform a clean only or a clean and condition after completion of the Oil Injector test.*

Cleaner Spray Test

The test for the Cleaner spray is used to verify the cleaner coverage. This test allows the technician to visually see how well the cleaning spray is covering the lane during a cleaning run. The process is performed in two passes of the lane machine. The first pass of the machine will clean approximately 25 feet of the bowling lane. The second pass sprays cleaner to the bowling lane as it travels without interference of the duster and the squeegee assembly. The cleaner will pulse about half way through the second run. Cleaner spray pressure during this test should be between 17-19 psi.

To test the Cleaner Spray on the lane:

1. Go to the Maintenance menu.
2. Select “Diagnostics” and press “OK”.
3. Use the up/down arrows to navigate to “Tests” and press “OK”.
4. Select the Cleaner Spray test, press “OK” and the following screen will appear (“Cleaner Spray” will appear at the top of the screen for the spray test). Refer to Figure 5-33.

Figure 5-33. Cleaner Spray

5. Press “OK” to prepare the machine for operation.
6. Put the lane machine on the lane when the message appears.
7. Press “OK” to start the test. The machine will clean the first 25 feet of the lane.
8. After the machine returns to the foul line, press “OK” again to complete the Cleaner Spray test utilizing the cleaner spray only.

NOTE: *It is important to either clean only or clean and condition the lane after performing the Cleaner Spray test. Do not allow cleaner to dry on the bowling lane.*

Maintenance Logs

Most programming changes and all of the maintenance and error messages displayed are tracked and can be viewed on the Logs screen to make troubleshooting faster and more reliable. Users with Level 1 or 2 security access can view all logs. **Logs cannot be edited or deleted by the user**. Refer to Figure 5-34.

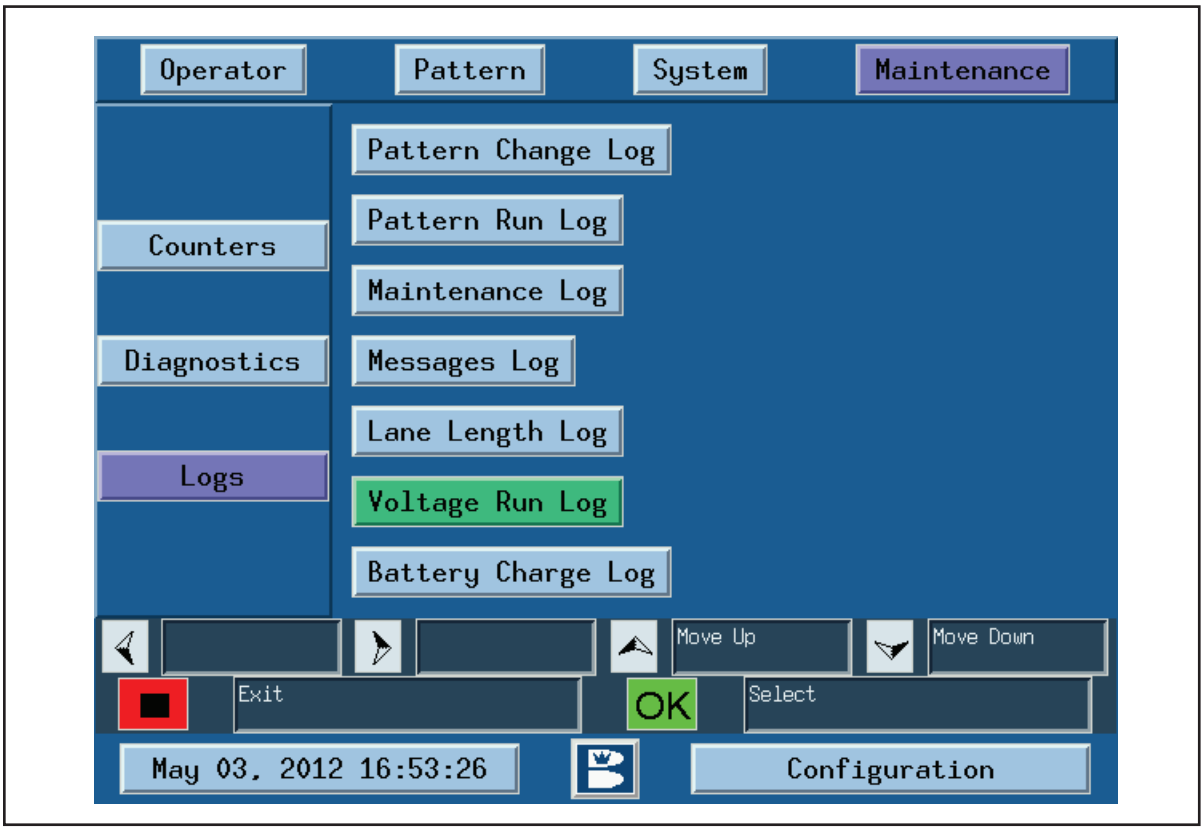


Figure 5-34. Maintenance Logs

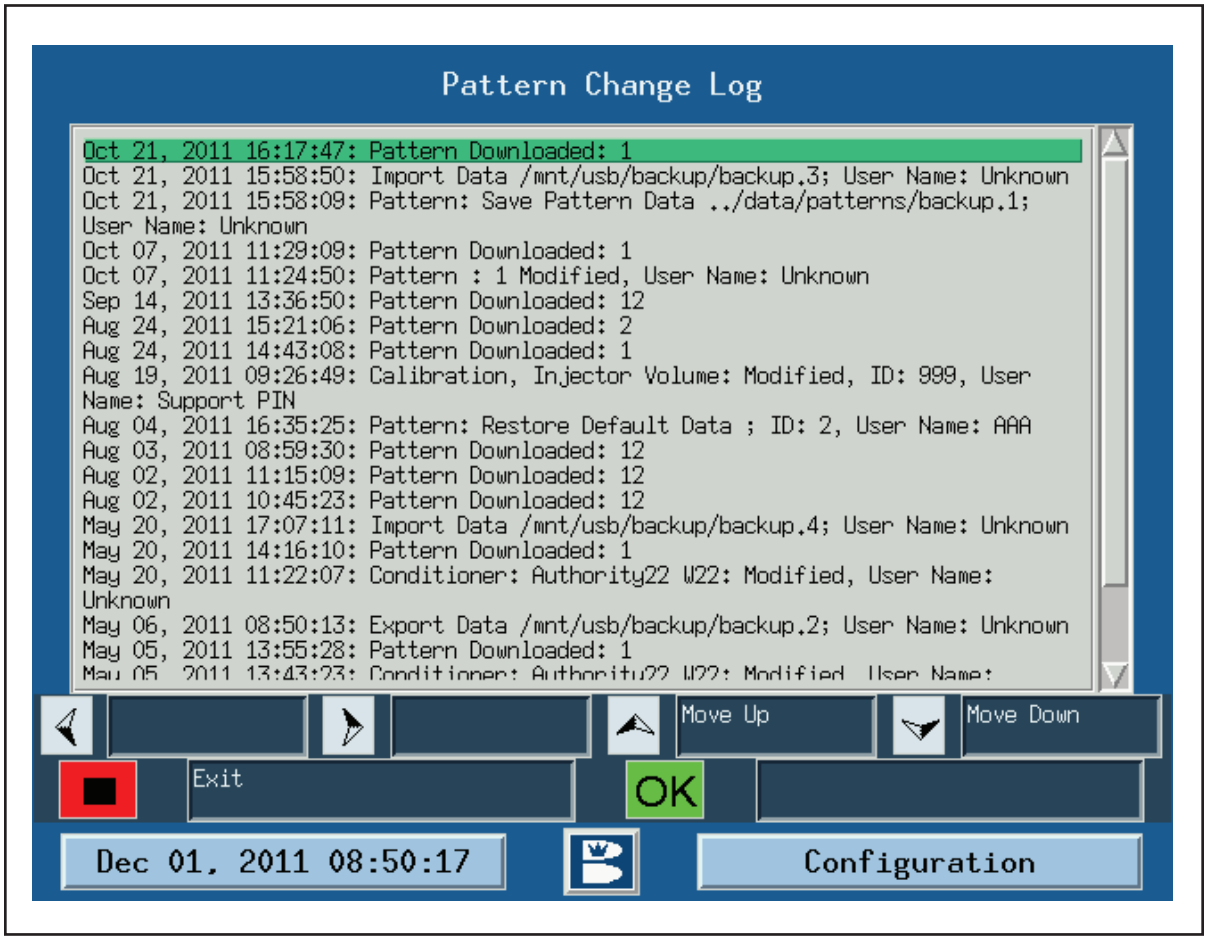

Pattern Change Log
Oct 21, 2011 16:17:47: Pattern Downloaded: 1
Oct 21, 2011 15:58:50: Import Data /mnt/usb/backup/backup.3; User Name: Unknown
Oct 21, 2011 15:58:09: Pattern: Save Pattern Data ../data/patterns/backup.1;
User Name: Unknown
Oct 07, 2011 11:29:09: Pattern Downloaded: 1
Oct 07, 2011 11:24:50: Pattern : 1 Modified, User Name: Unknown
Sep 14, 2011 13:36:50: Pattern Downloaded: 12
Aug 24, 2011 15:21:06: Pattern Downloaded: 2
Aug 24, 2011 14:43:08: Pattern Downloaded: 1
Aug 19, 2011 09:26:49: Calibration, Injector Volume: Modified, ID: 999, User
Name: Support PIN
Aug 04, 2011 16:35:25: Pattern: Restore Default Data ; ID: 2, User Name: AAA
Aug 03, 2011 08:59:30: Pattern Downloaded: 12
Aug 02, 2011 11:15:09: Pattern Downloaded: 12
Aug 02, 2011 10:45:23: Pattern Downloaded: 12
May 20, 2011 17:07:11: Import Data /mnt/usb/backup/backup.4; User Name: Unknown
May 20, 2011 14:16:10: Pattern Downloaded: 1
May 20, 2011 11:22:07: Conditioner: Authority22 W22: Modified, User Name:
Unknown
May 06, 2011 08:50:13: Export Data /mnt/usb/backup/backup.2; User Name: Unknown
May 05, 2011 13:55:28: Pattern Downloaded: 1
Move Up
Move Down
Exit
OK
Dec 01, 2011 08:50:17
Configuration

Figure 5-35. Log Pattern Change

This log tracks all changes to any pattern parameter or pattern modifications. It also logs the date and time of the change and the ID of the user who made the change, if the login feature is enabled. Refer to Figure 5-35.

1. Go to the Maintenance menu.
2. Select “Logs” and press “OK”.
3. Use the up/down arrows to navigate to select “Pattern Change Log” and press “OK”.
4. Use the up/down arrows to view the entire log.

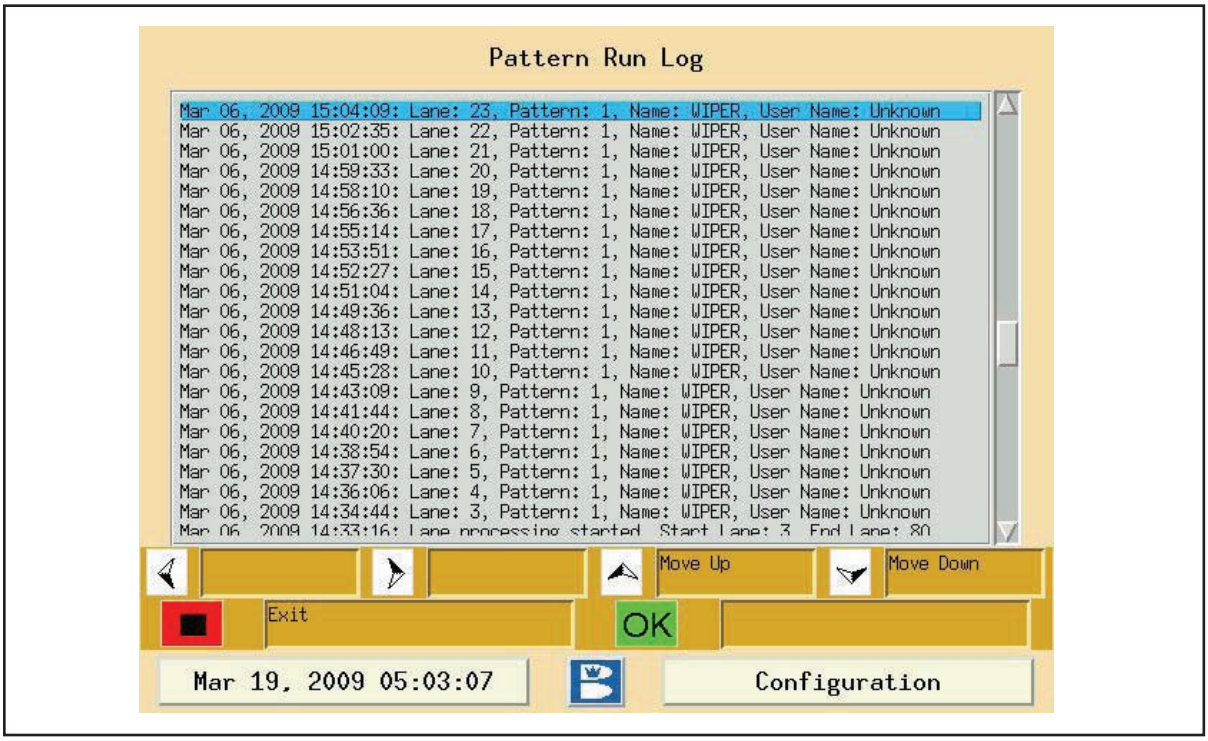

Pattern Run Log
Mar 06, 2009 15:04:09: Lane: 23, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 15:02:35: Lane: 22, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 15:01:00: Lane: 21, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:59:33: Lane: 20, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:58:10: Lane: 19, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:56:36: Lane: 18, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:55:14: Lane: 17, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:53:51: Lane: 16, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:52:27: Lane: 15, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:51:04: Lane: 14, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:49:36: Lane: 13, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:48:13: Lane: 12, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:46:49: Lane: 11, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:45:28: Lane: 10, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:43:09: Lane: 9, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:41:44: Lane: 8, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:40:20: Lane: 7, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:38:54: Lane: 6, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:37:30: Lane: 5, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:36:06: Lane: 4, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:34:44: Lane: 3, Pattern: 1, Name: WIPER, User Name: Unknown
Mar 06, 2009 14:33:16: Lane processing started. Start Lane: 3. End Lane: 80
Move Up
Move Down
Exit
OK
Mar 19, 2009 05:03:07
Configuration

Figure 5-36. Pattern Run Log

This log provides historical information on the machine's operations including what lanes were run, in what order the lanes were run, the times the lanes were run, which patterns were run on each lane, any pattern overrides, and the ID of the user who ran the lanes, if the login feature is enabled. Refer to Figure 5-36.

1. Go to the Maintenance menu.
2. Select "Logs" and press "OK".
3. Use the up/down arrows to navigate to select "Pattern Run Log" and press "OK".
4. Use the up/down arrows to view the entire log.

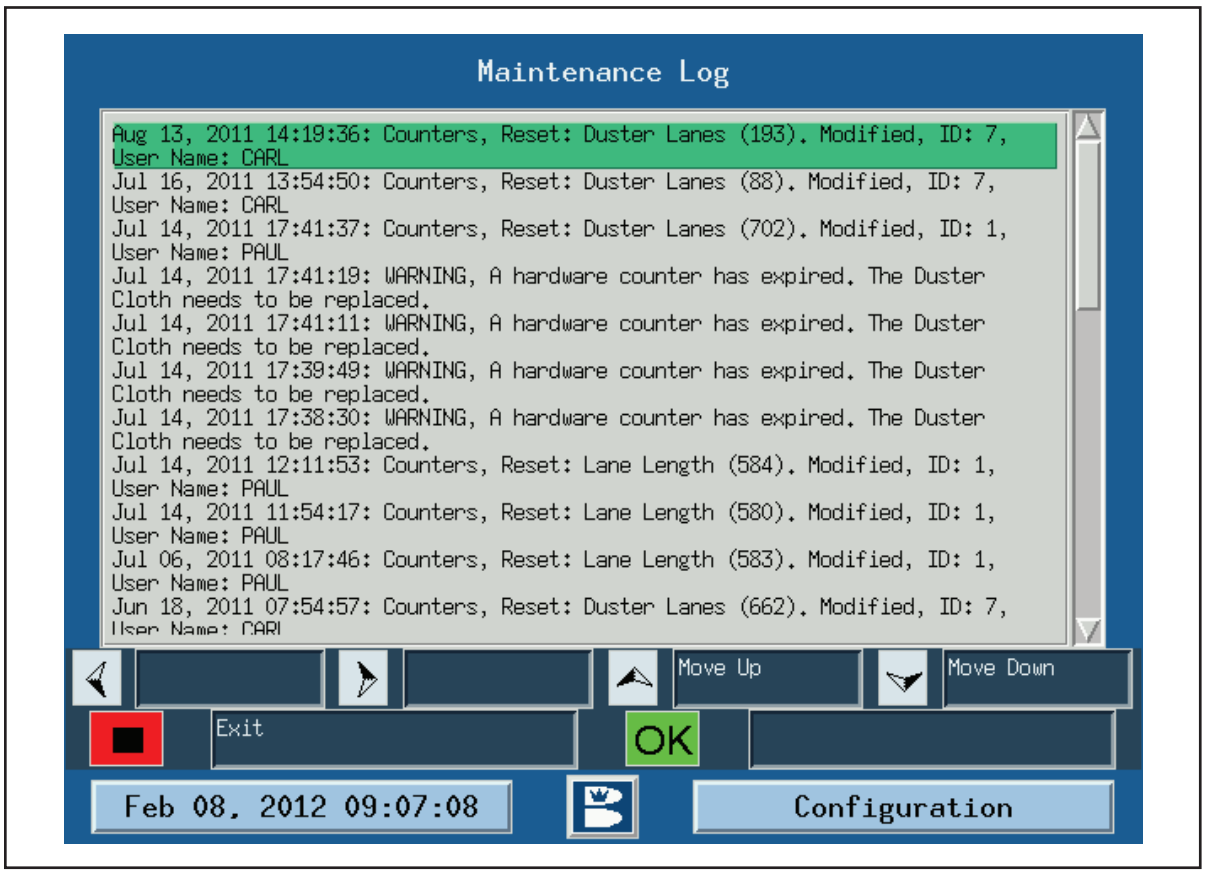

Maintenance Log
Aug 13, 2011 14:19:36: Counters, Reset: Duster Lanes (193). Modified, ID: 7,
User Name: CARL
Jul 16, 2011 13:54:50: Counters, Reset: Duster Lanes (88). Modified, ID: 7,
User Name: CARL
Jul 14, 2011 17:41:37: Counters, Reset: Duster Lanes (702). Modified, ID: 1,
User Name: PAUL
Jul 14, 2011 17:41:19: WARNING, A hardware counter has expired. The Duster
Cloth needs to be replaced.
Jul 14, 2011 17:41:11: WARNING, A hardware counter has expired. The Duster
Cloth needs to be replaced.
Jul 14, 2011 17:39:49: WARNING, A hardware counter has expired. The Duster
Cloth needs to be replaced.
Jul 14, 2011 17:38:30: WARNING, A hardware counter has expired. The Duster
Cloth needs to be replaced.
Jul 14, 2011 12:11:53: Counters, Reset: Lane Length (584). Modified, ID: 1,
User Name: PAUL
Jul 14, 2011 11:54:17: Counters, Reset: Lane Length (580). Modified, ID: 1,
User Name: PAUL
Jul 06, 2011 08:17:46: Counters, Reset: Lane Length (583). Modified, ID: 1,
User Name: PAUL
Jun 18, 2011 07:54:57: Counters, Reset: Duster Lanes (662). Modified, ID: 7,
Move Up
Move Down
Exit
OK
Feb 08, 2012 09:07:08
Configuration

Figure 5-37. Log Maintenance

This log tracks when hardware items needed to be replaced, when counters were reset, and provides a date and time stamp and user name to verify when these actions took place. Refer to Figure 5-37.

1. Go to the Maintenance menu.
2. Select “Logs” and press “OK”.
3. Use the up/down arrows to navigate to select “Maintenance Log” and press “OK”.
4. Use the up/down arrows to view the entire log.

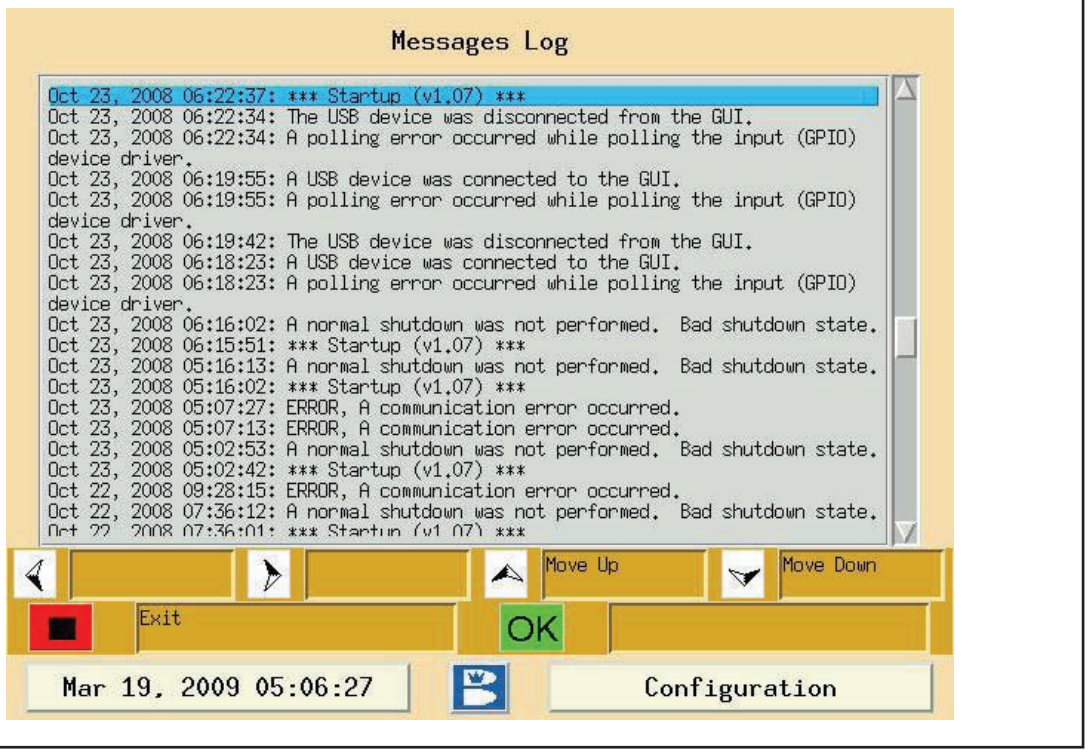

Messages Log
Oct 23, 2008 06:22:37: *** Startup (v1.07) ***
Oct 23, 2008 06:22:34: The USB device was disconnected from the GUI.
Oct 23, 2008 06:22:34: A polling error occurred while polling the input (GPIO) device driver.
Oct 23, 2008 06:19:55: A USB device was connected to the GUI.
Oct 23, 2008 06:19:55: A polling error occurred while polling the input (GPIO) device driver.
Oct 23, 2008 06:19:42: The USB device was disconnected from the GUI.
Oct 23, 2008 06:18:23: A USB device was connected to the GUI.
Oct 23, 2008 06:18:23: A polling error occurred while polling the input (GPIO) device driver.
Oct 23, 2008 06:16:02: A normal shutdown was not performed. Bad shutdown state.
Oct 23, 2008 06:15:51: *** Startup (v1.07) ***
Oct 23, 2008 05:16:13: A normal shutdown was not performed. Bad shutdown state.
Oct 23, 2008 05:16:02: *** Startup (v1.07) ***
Oct 23, 2008 05:07:27: ERROR, A communication error occurred.
Oct 23, 2008 05:07:13: ERROR, A communication error occurred.
Oct 23, 2008 05:02:53: A normal shutdown was not performed. Bad shutdown state.
Oct 23, 2008 05:02:42: *** Startup (v1.07) ***
Oct 22, 2008 09:28:15: ERROR, A communication error occurred.
Oct 22, 2008 07:36:12: A normal shutdown was not performed. Bad shutdown state.
Move Up
Move Down
Exit
OK
Mar 19, 2009 05:06:27
Configuration

Figure 5-38. Messages Log

This log tracks all errors and warning messages and provides a date and time stamp to verify when those messages were displayed Refer to Figure 5-38.

1. Go to the Maintenance menu.
2. Select “Logs” and press “OK”.
3. Use the up/down arrows to navigate to select “Messages Log” and press “OK”.
4. Use the up/down arrows to view the entire log.

NOTE: *Maintenance logs can be backed up to a USB flash drive as explained earlier in Section 4, “Backing Up and Importing Data”. These logs may contain information that is helpful to Brunswick Technical Support when troubleshooting issues. They can explain how to attach backup files to an e-mail or ship the USB flash drive with your center maintenance logs. The maintenance logs, counters and critical center data cannot be imported back to your GUI.*

Lane Length Log

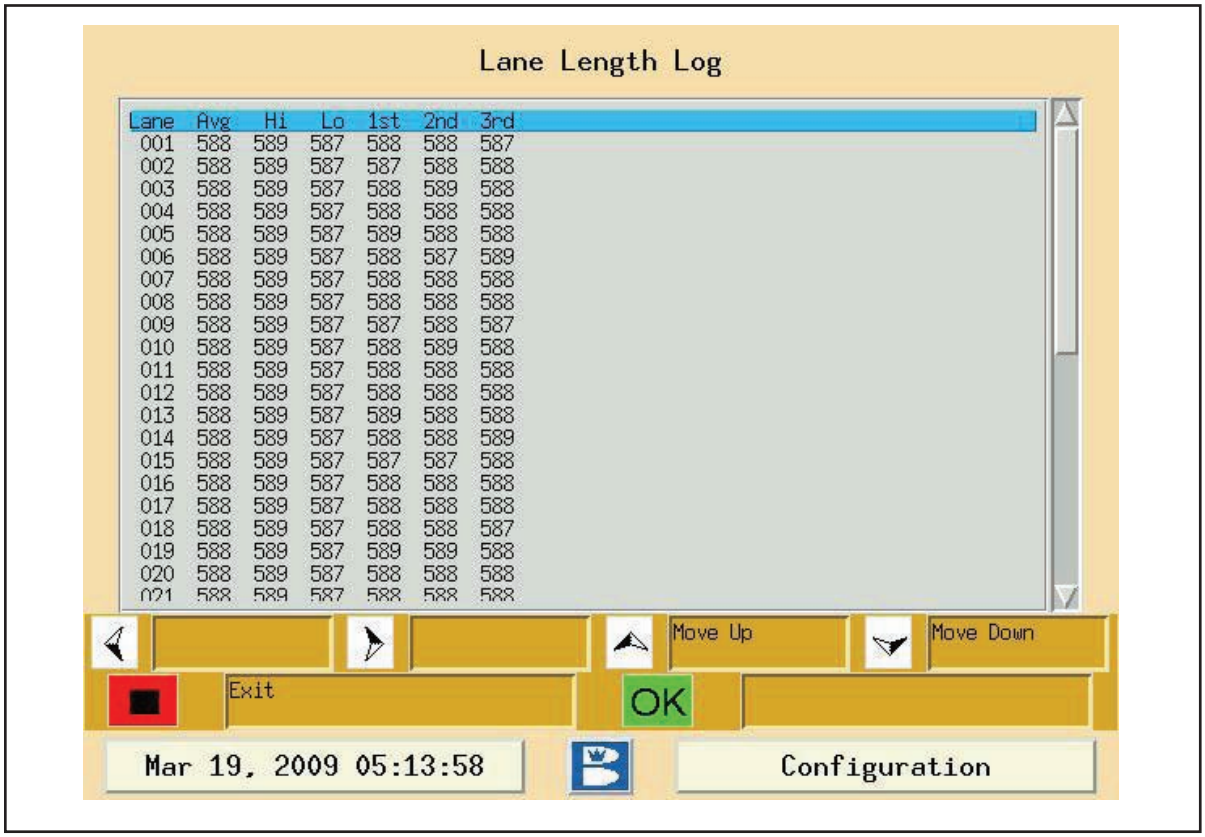


Figure 5-39. Lane Length Log

This log displays the lane length date for each lane number in the bowling center. The data is recorded in “tick counts”, which is the number of distance encoder ticks before the end of lane senors is triggered for each lane. Refer to Figure 5-39.

The average, highest and lowest tick counts are displayed for each lane along with the actual value for the last three runs on that lane.

This information can show how consistent the recorded tick count is for each lane to indicate possible distance encoder or end of lane sensor maintenance. This information is only accurate if the operator verifies that they only run the same lane that is displayed on the current lane number on the center of the GUI.

The lane length will not be recorded in this log if the lane machine displays an error relating to the “tick count” or end-of-lane sensor. The most common cause for this type of error is a short (low) tick count caused by an operator pushing the lane machine beyond the foul line before pressing the start button. The lane length may need to be reset in the counter option of the maintenance screen to correct.

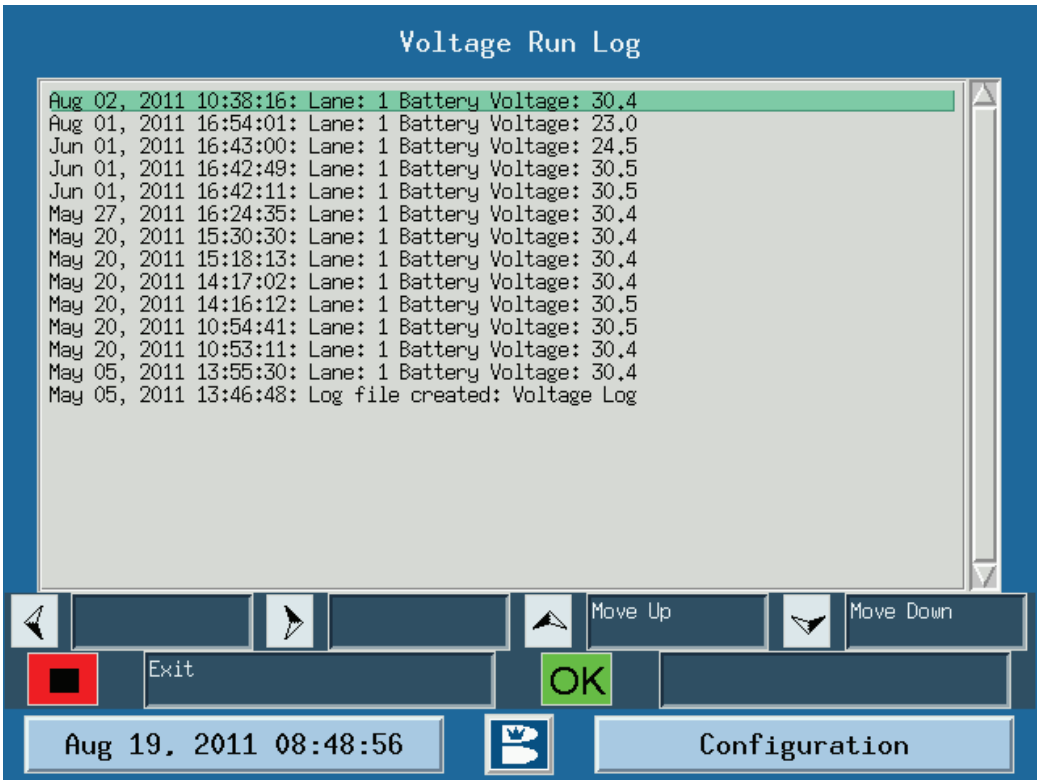

Voltage Run Log
Aug 02, 2011 10:38:16: Lane: 1 Battery Voltage: 30.4
Aug 01, 2011 16:54:01: Lane: 1 Battery Voltage: 23.0
Jun 01, 2011 16:43:00: Lane: 1 Battery Voltage: 24.5
Jun 01, 2011 16:42:49: Lane: 1 Battery Voltage: 30.5
Jun 01, 2011 16:42:11: Lane: 1 Battery Voltage: 30.5
May 27, 2011 16:24:35: Lane: 1 Battery Voltage: 30.4
May 20, 2011 15:30:30: Lane: 1 Battery Voltage: 30.4
May 20, 2011 15:18:13: Lane: 1 Battery Voltage: 30.4
May 20, 2011 14:17:02: Lane: 1 Battery Voltage: 30.4
May 20, 2011 14:16:12: Lane: 1 Battery Voltage: 30.5
May 20, 2011 10:54:41: Lane: 1 Battery Voltage: 30.5
May 20, 2011 10:53:11: Lane: 1 Battery Voltage: 30.4
May 05, 2011 13:55:30: Lane: 1 Battery Voltage: 30.4
May 05, 2011 13:46:48: Log file created: Voltage Log
Move Up
Move Down
Exit
OK
Aug 19, 2011 08:48:56
Configuration

Figure 5-40. Voltage Run Log

The voltage log records the voltage of the battery while the machine is in use. The GUI records the voltage data at three different times for each lane that is maintained. This information can be useful as a tracking tool to monitor voltage drop trends. This could also be used to troubleshoot potential voltage issues with the batteries. Refer to Figure 5-40.

1. Go to the Maintenance menu
2. Select “Logs” and press “OK”
3. Use the up/down arrows to navigate to “Voltage Log” and press “OK”
4. Use the up/down arrows to view the entire log.

Battery Charge Log

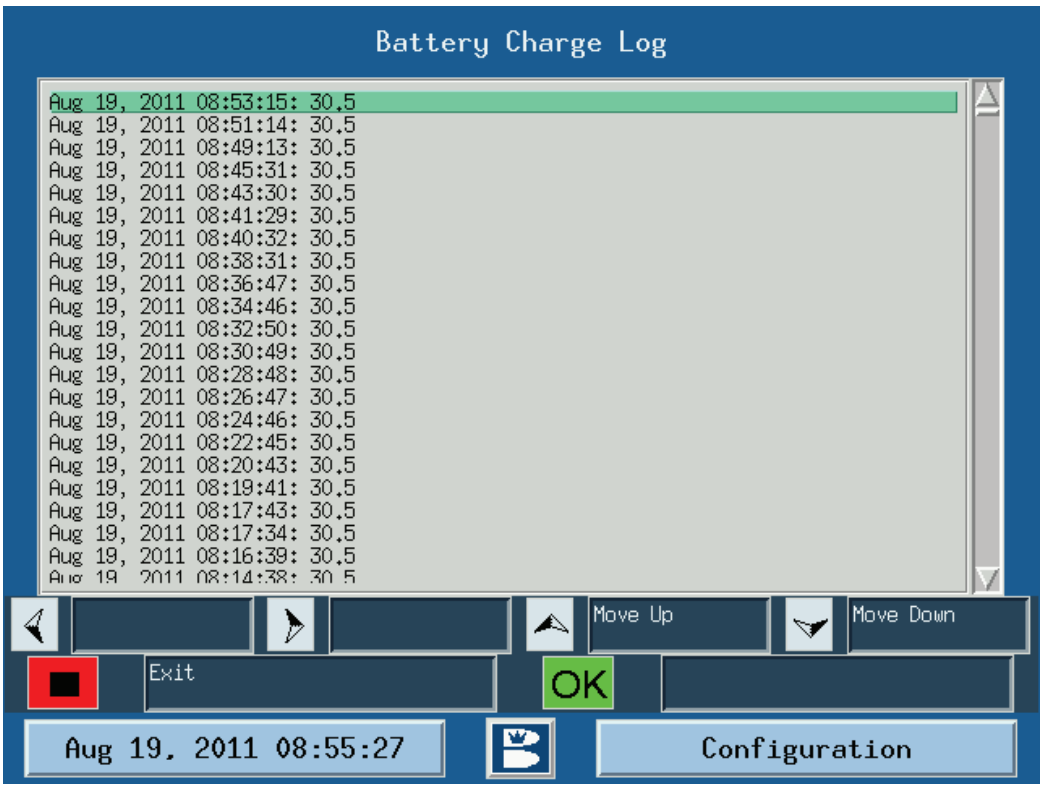


Figure 5-41. Battery Charge Log

The battery charge log will record the battery voltage during the charging cycle. It will take a "snapshot" of this voltage every two minutes. Similar to the Voltage Log, this log will give you the ability to track and troubleshoot the charging operation of the Envoy batteries and charging unit. Refer to Figure 5-41.

1. Go to the Maintenance menu
2. Select "Logs" and press "OK"
3. Use the up/down arrows to navigate to "Battery Charge Log" and press "OK"
4. Use the up/down arrows to view the entire log.

Section 6: Maintenance & Service

All machines need regular maintenance to stay in good working condition. The Envoy was designed to make routine maintenance easy—parts are located where you can get to them and maintenance procedures are logical and simple to follow.

In this section you will find:

1. Checklist for daily maintenance
2. Checklist for weekly maintenance
3. Checklist for annual maintenance
4. Quick-List of “Counter” limits
5. Step-by-step instructions for replacing, servicing, and adjusting machine components

BEFORE YOU PERFORM ANY MAINTENANCE

Before undertaking any maintenance, you should be familiar with the following Maintenance precautions and all of the Safety precautions noted in Section 1: Safety. In order to safely maintain this machine, you must be trained in the procedures in this manual, including the use of common mechanic’s hand tools and any special Brunswick tools. For clarification on any of this information, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

Always perform maintenance in an open area, away from lanes and approaches.

DAILY MAINTENANCE

WARNING! Before performing maintenance, be sure the power cord is disconnected from both the machine and the wall outlet. Replace the protective sleeve and heat shrink tubing on the power cord if they become damaged.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

Refer to the Daily Maintenance Decal and Location information in Section 1, Figure 1-3.

Daily Maintenance in Operating Position

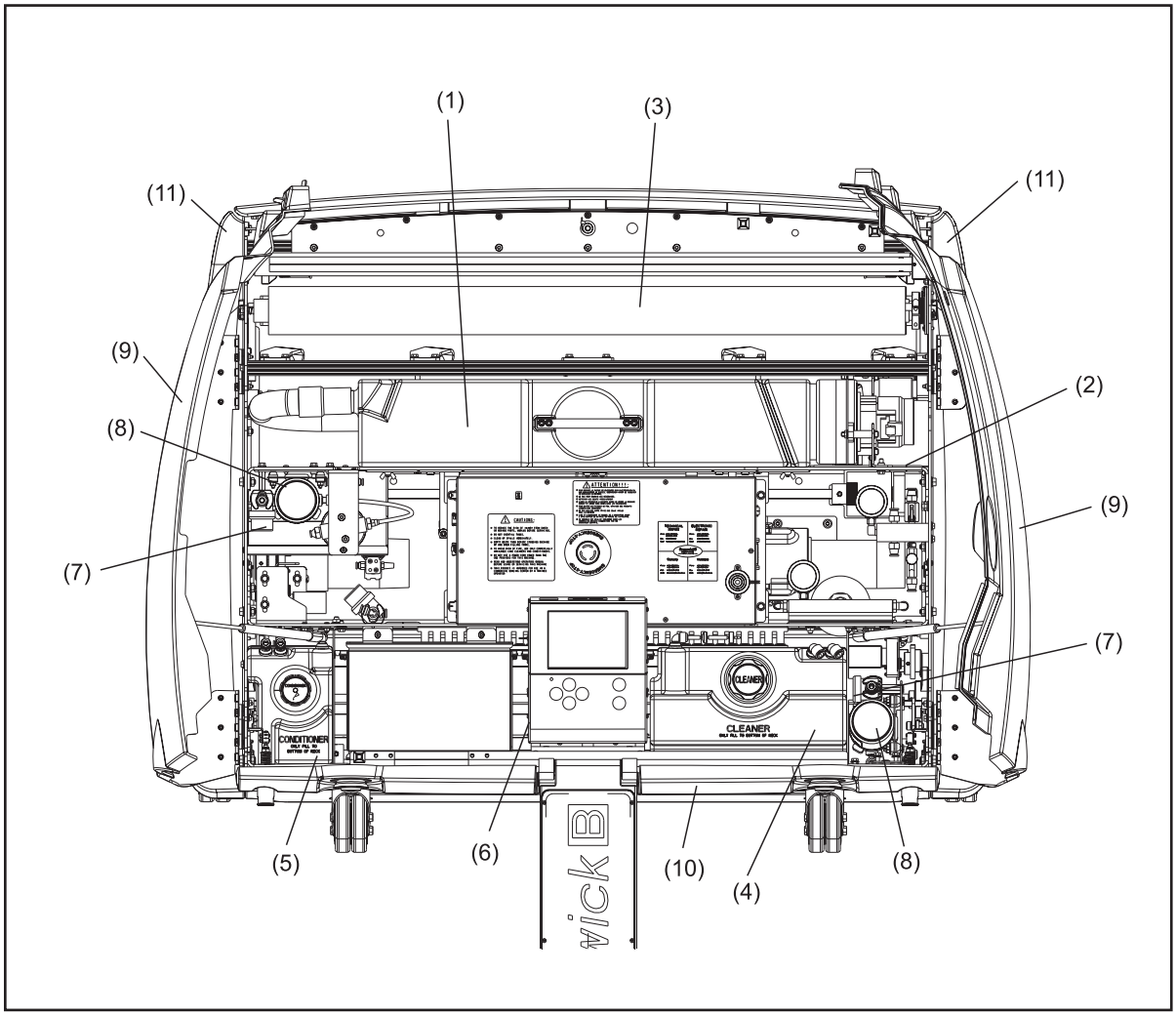


Figure 6-1. Operating Position - Daily Maintenance

(1) WASTE RECOVERY TANK
(2) FRAME DIVISION WALL
(3) DUSTER CLOTH SUPPLY ROLL
(4) CLEANER SUPPLY TANK
(5) CONDITIONER TANK
(6) BUFFER BRUSH GUARD
(7) FILTERS
(8) PUMPS
(9) TOP COVERS
(10) REAR COVER
(11) SIDE COVERS

1. Empty waste recovery tank, after each use, and wipe with a dry cloth.

CAUTION! You must empty the waste recovery tank before transporting machine.

2. Wipe frame division wall.

3. Check duster cloth supply roll and replace if needed.

4. Fill cleaner supply tank.

   a. Remove cap from cleaning tank, remove cap on end of the fill tube, located on the cleaner mixing vessel, and insert fill tube into cleaning tank.

CAUTION! Use only Brunswick approved cleaning fluids.

b. Press and hold button on container until cleaner nears the bottom of the tank neck. Do not fill into the neck of the tank.

c. Release button and let cleaner remaining in tube drain into tank before replacing the cap on the end of the fill tube.

d. Wipe any drips that collect in the depressed area around the outside of the tank neck.

WARNING! Fill and empty tanks with the machine in operating position and away from lanes and approaches. Use the no-spill containers to avoid spilling. Clean all spills and drips immediately.

5. Fill **conditioner supply tank.**

NOTE: *The no-spill spout in the spare parts kit should fit onto the conditioner container.*

a. Remove cap from conditioner tank, remove cap on end of the fill tube located on the conditioner no-spill spout and insert fill tube into conditioner tank.

CAUTION! Use only Brunswick approved conditioner fluids.

b. Press and hold button on container until conditioner nears the bottom of the tank neck. Do not fill into the neck of the tank.

c. Release button and let conditioner remaining in tube drain into tank before replacing the cap on the end of the fill tube.

d. Wipe any drips that collect in the depressed area around the outside of the tank neck.

6. Wipe conditioning compartment including **buffer brush guard, filters, tanks, pumps** and **felt** with a dry cloth.

WARNING! Take care when working around electrical connections to avoid damaging wire connections.

7. Wipe **top, rear** and **side covers**.

Daily Maintenance in Transport Position:

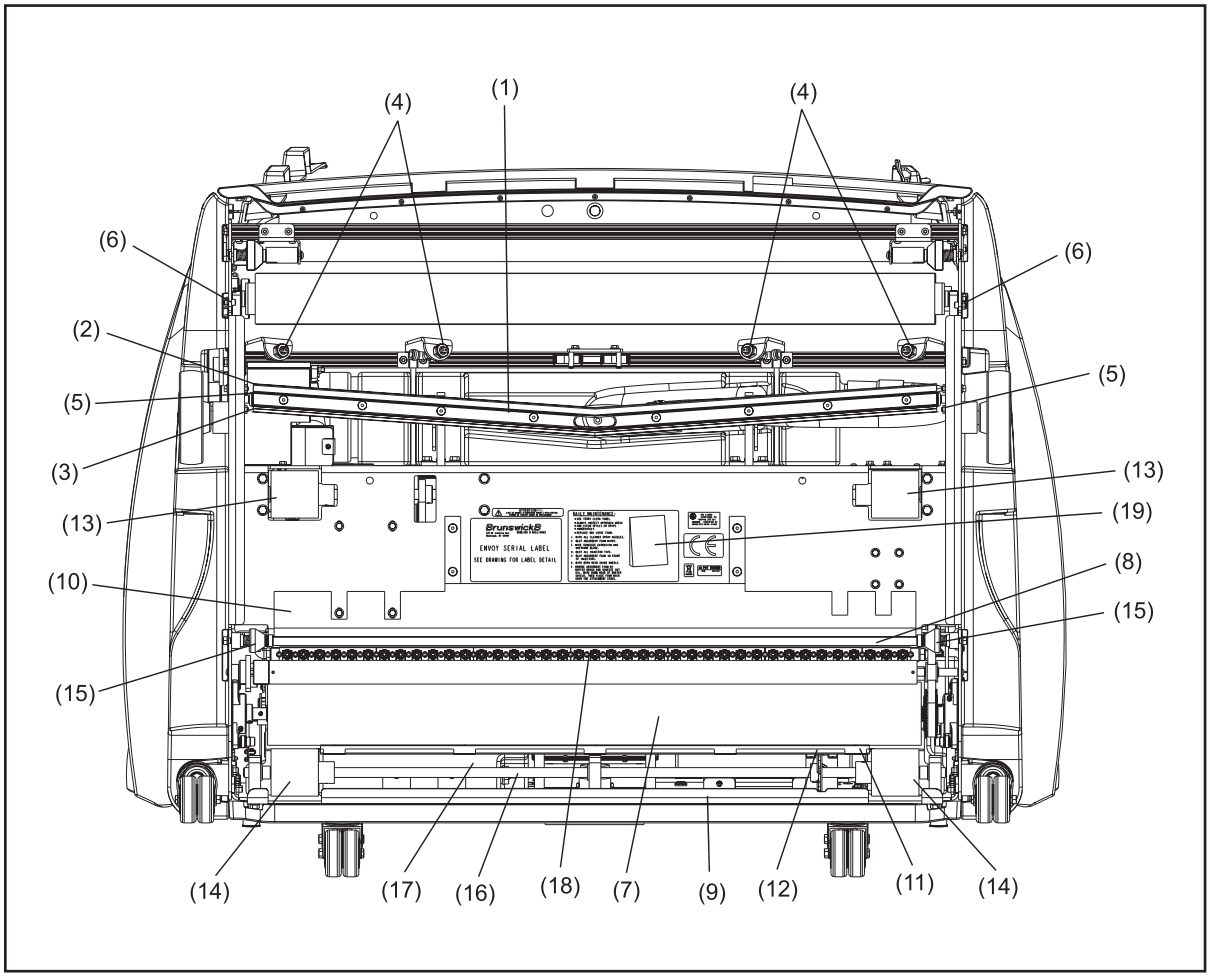


Figure 6-2. Transport Position - Daily Maintenance

(1) SQUEEGEE HEAD ASSEMBLY
(2) ABSORBENT WIPER
(3) SQUEEGEE BLADE
(4) CLEANER SPRAY NOZZLES
(5) SQUEEGEE ADJUSTMENT GUIDE BLOCKS
(6) CONTACT ROLLER PIVOT ARMS
(7) BUFFER BRUSH
(8) FRAME DIVISION WALL
(9) REAR WALL
(10) ABSORBENT FOAM IN FRONT OF INJECTORS
(11) FOAM STRIP
(12) BUFFER BRUSH SHIELD
(13) TRACTION DRIVE WHEELS
(14) REAR WHEELS
(15) REAR GUIDE WHEELS
(16) REAR SHAFT AREA
(17) REAR FRAME AREA
(18) INJECTOR TIPS
(19) DAILY MAINTENANCE DECAL

To keep your Envoy looking and performing in like new condition, be diligent with the daily maintenance. Wipe any areas that may become dirty and address any maintenance issues immediately.

1. Wipe **cleaner spray nozzles**.

2. Wipe the entire **squeegee head assembly** including the **absorbent wiper** and **squeegee blade** with a dry terry cloth to remove dirt and moisture.

3. Wipe the **squeegee adjustment guide blocks** for the squeegee head assembly.

4. Wipe the c**ontact roller pivot arms**.

5. Wipe **buffer brush** area including **frame division wall, rear wall,** and **absorbent foam in front of injectors.**

6. Wipe bottom side of machine, including **traction drive, rear wheels, rear guide wheels, rear shaft,** and **rear frame area.**

7. Blot **injector tips** with a lint-free terry cloth.

8. Remove the **foam strip** from the lower edge of the buffer shield. Squeeze the conditioner from the foam strip by placing it between layers of a terry cloth towel and applying pressure. Do not twist or wring out the foam strip to avoid stretching or tearing it.

9. Wipe the inside surface of the **buffer brush shield** with a terry cloth towel.

10. Replace the dry foam strip over the retaining pins on the buffer shield. Make sure that the foam strip is pushed completely onto the base of the retaining pins so there is no gap between the surface of the buffer shield and the foam strip.

11. Replace the buffer shield foam strip with a replacement in the spare parts kit or order a new foam strip (reorder part number 14-100427-000) if it becomes torn, stretched or doesn't remain tightly attached to the buffer brush shield.

12. Begin the battery charging cycle.

    a. Plug the battery charger into the charging port on the 7pin side of the machine covers.

    b. Verify the green power light is on – if not check the E-stop and power switches to verify they are not off.

    c. Plug in and turn on the battery charger.

    d. Verify the red charging indicator is on.

WARNING! Always inspect approach areas and clean spills or drips immediately. Replace any loose foam.

NOTE: *The Daily Maintenance Decal on the bottom of the machine (refer to Figure 6-2) contains helpful reminders for each step explained above.*

WEEKLY MAINTENANCE

In addition to daily maintenance, these tasks should be done once a week, depending on use.

WARNING! Before performing maintenance, be sure the charger cord is disconnected from the machine and shut the machine off.

Weekly Maintenance in Operating Position

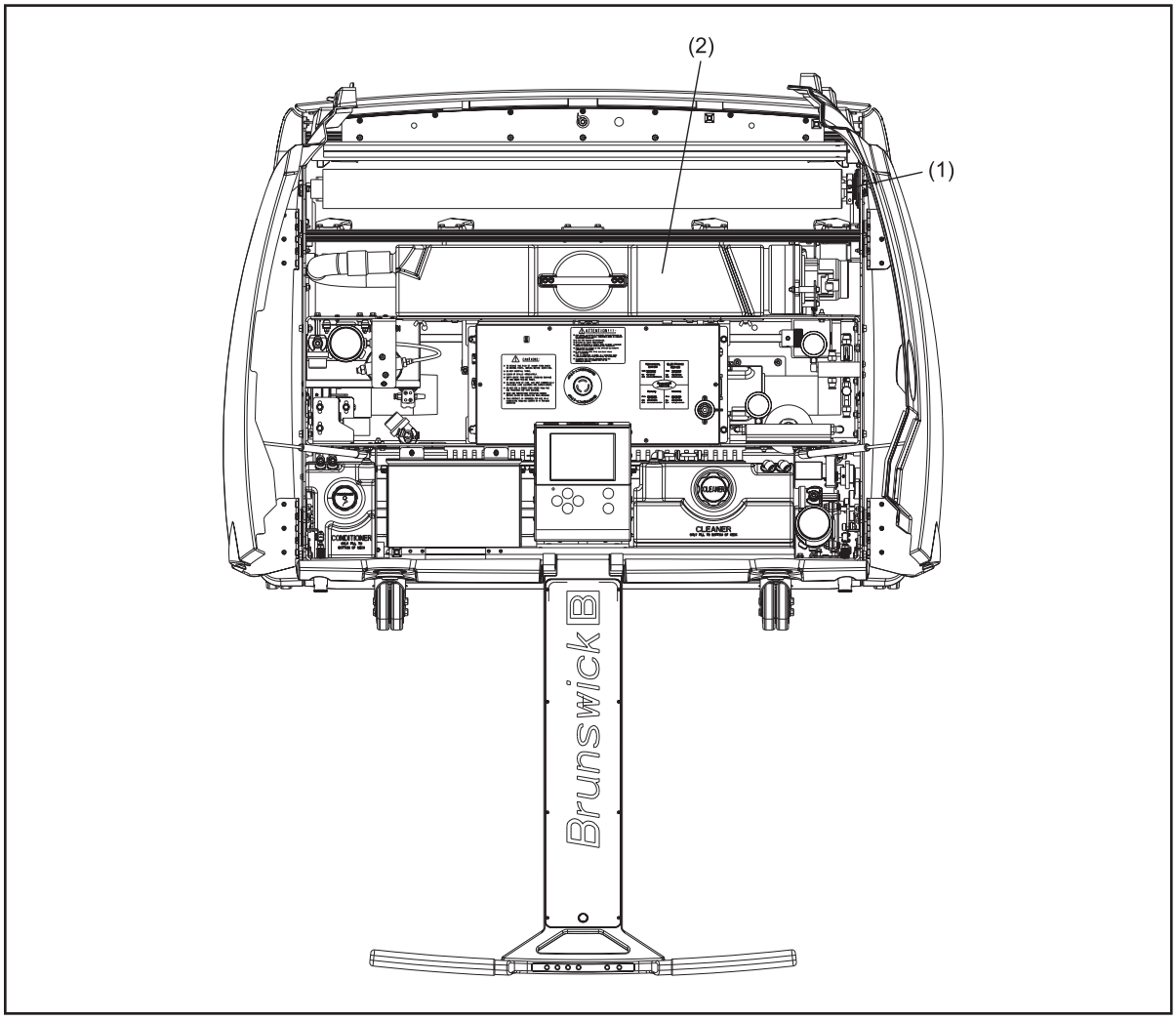


Figure 6-3. Operating Position - Weekly Maintenance

(1) DUSTER CLUTCH ASSEMBLY (2) WASTE RECOVERY TANK

1. Check the tension setting on **duster clutch assembly.**

For more information go to the **adjusting the duster clutch** section.

2. Rinse waste **recovery tank.**

3. Inspect all **electrical connections** for loose or damaged wires.

Weekly Maintenance in Transport Position

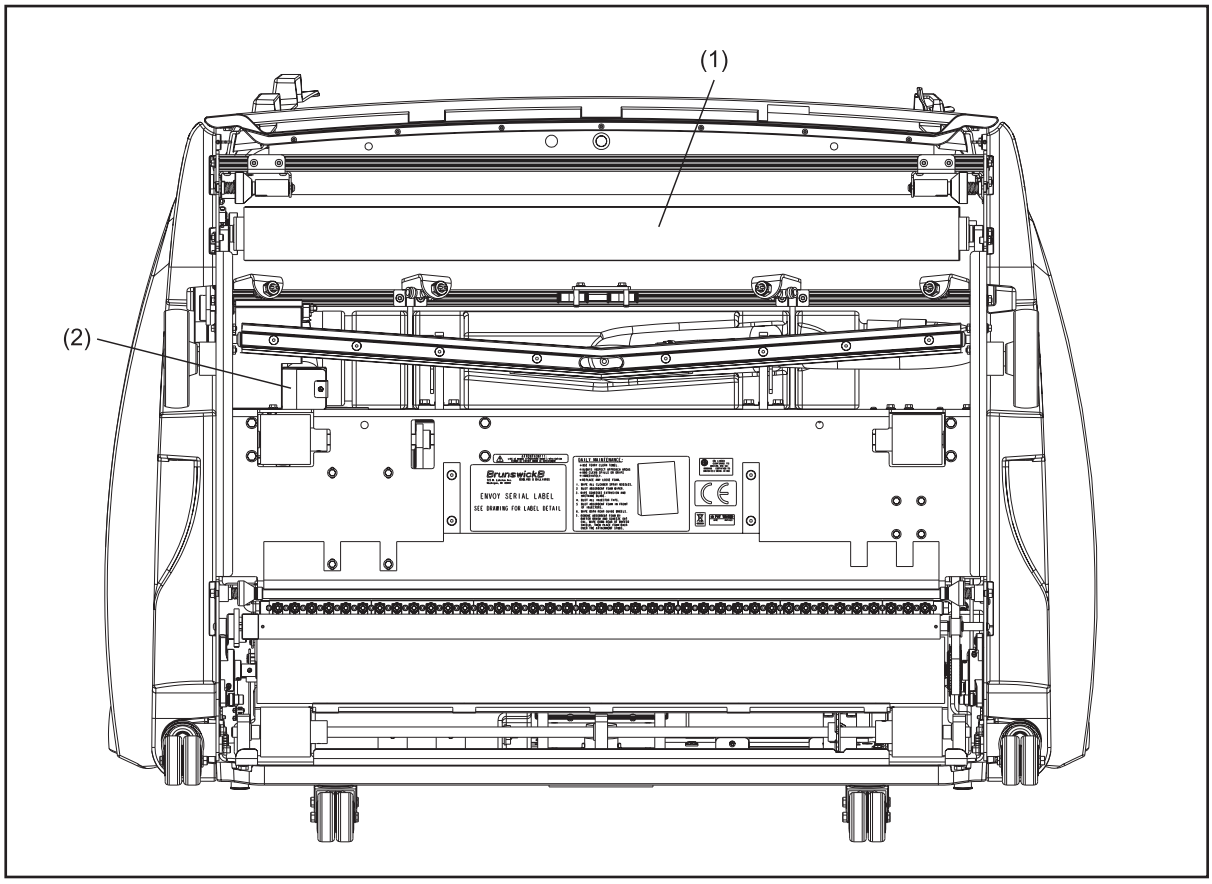


Figure 6-4. Transport Position - Weekly Maintenance

(1) DUSTER CLOTH CONTACT ROLLER (2) VACUUM EXHAUST DEFLECTOR

1. Wipe duster contact roller with a dry cloth.

2. Remove and squeeze out the absorbent foam material inside the vacuum exhaust deflector.

3. Check the absorbent wiper on the front of the squeegee blade. Flip the direction of bend every 1 to 3 months (5000 lanes) and replace every 3 to 6 months or sooner if it becomes damaged.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

ANNUAL MAINTENANCE

In addition to the daily and weekly maintenance, these items should be done once a year, depending on use. The Envoy uses high-quality parts to ensure long life. Yet with the demands of daily use, you'll want to replace parts that wear and check the adjustment of other components to keep your machine in peak working order.

Wear on your machine is directly related to the amount of use and quality of preventative maintenance. Your replacement needs may be higher or lower than the guidelines given here. If you have questions about maintaining your machine, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

WARNING! Before performing maintenance, be sure the charger cord is disconnected from the machine and shut the machine off.

Annual Maintenance in Operating Position

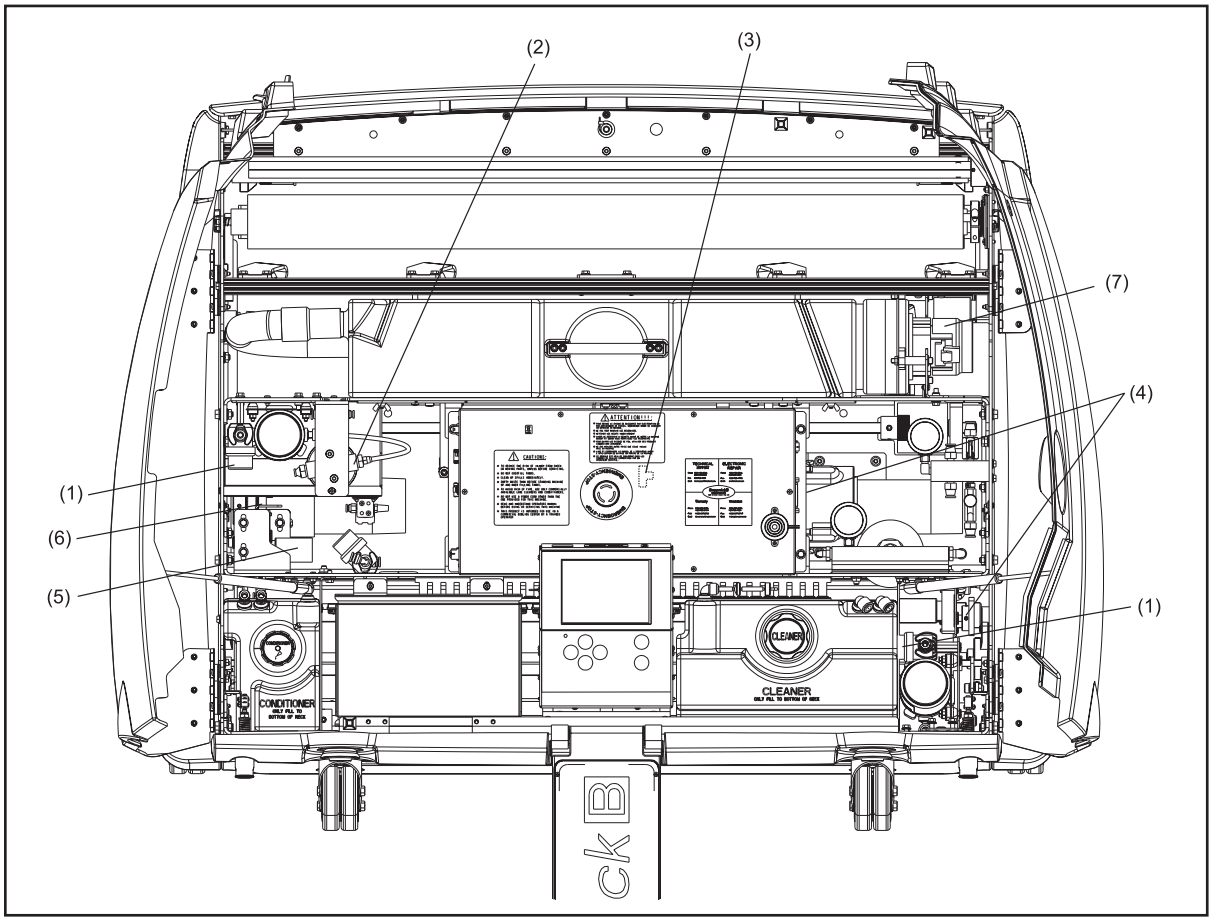


Figure 6-5. Operating Position - Annual Maintenance

(1) CLEANER/CONDITIONER SCREEN FILTERS
(2) CONDITIONER SPIN-ON FILTER
(3) SQUEEGEE LIFTING ASSEMBLY
(4) TRACTION DRIVE/DISPERSION ROLLER CHAINS
(5) BUFFER LIFTING ASSEMBLY
(6) BUFFER DRIVE BELT
(7) VACUUM MOTOR ASSEMBLY

NOTE: *The following procedures are explained in detail next, in the* ***How to Replace, Adjust, or Lubricate Parts*** *portion.*

1. Clean or replace in-line **cleaner**, and **conditioner screen filters.**
2. Replace **conditioner spin-on filter.**
3. Lubricate **squeegee lifting assembly.**
4. Lubricate **traction drive chain** and **dispersion roller chain.**
5. Lubricate **buffer lifting assembly.**
6. Inspect buffer **drive belt,** check tension and adjust if needed.
7. Inspect all fittings and tubing for damage and replace if needed.
8. Inspect all electrical connections and repair or replace if needed.
9. Inspect **vacuum motor assembly,** clean and replace if needed.

WARNING! Before performing maintenance, be sure the charger cord is disconnected from the machine and shut the machine off.

WARNING! Brunswick recommends using a partner whenever possible to help with lifting or lowering the machine from the operating position. Take care when lowering this machine into the operating position. Use proper lifting and lowering techniques, bend at the knees, and use a back support, if needed.

Annual Maintenance in Transport Position

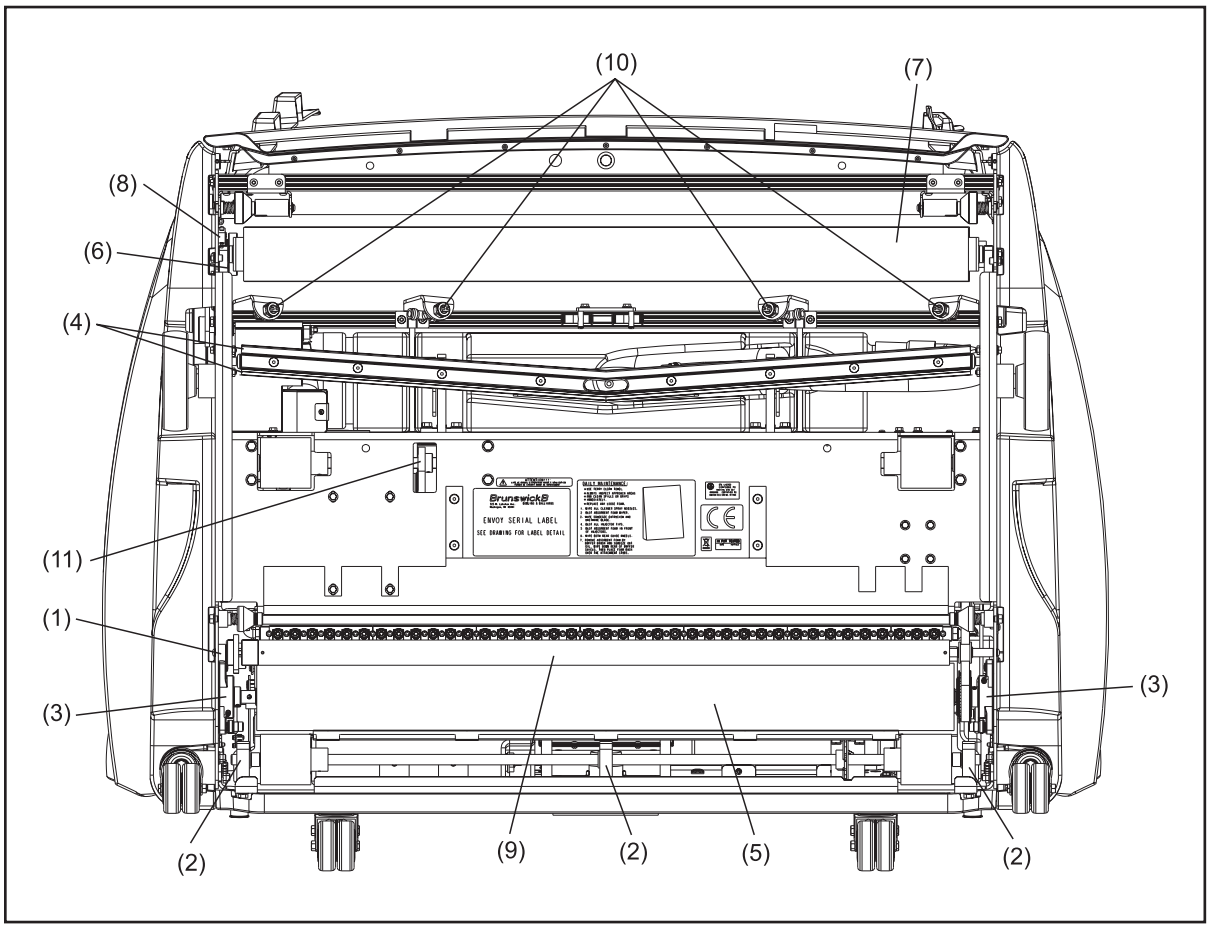


Figure 6-6. Transport Position - Annual Maintenance

(1) DISPERSION ROLLER (GREASE LOCATION)
(2) REAR WHEEL/TRACTION DRIVE BEARING BLOCKS
(3) BUFFER BRUSH BEARINGS
(4) ABSORBENT WIPER AND SQUEEGEE BLADE
(5) BUFFER BRUSH
(6) DUSTER CLUTCH ASSEMBLY
(7) DUSTER CONTACT ROLLER
(8) DUSTER UP/DOWN SWITCHES
(9) DISPERSION ROLLER
(10) CLEANER SPRAY NOZZLES AND CHECK VALVE FILTERS
(11) TRACTION DRIVE CHAIN

NOTE: *The following procedures are explained in detail next, in the* ***How to Replace, Adjust, or Lubricate Parts*** *portion.*

1. Grease **dispersion roller.**

2. Lubricate **rear-wheel bearing blocks** and **traction drive bearing blocks.**

3. Grease **buffer brush bearings.**

4. Replace **absorbent wiper** (flip every 1 to 3 months (2500 lanes) and replace every 6 months) and **squeegee blade** (flip every 3 to 6 months, replace every 12 months). You may need to replace them sooner depending on the usage of the machine.

5. Inspect **buffer brush** and replace if needed.

6. Inspect **duster clutch assembly** and **hardware** and replace if needed.

7. Inspect **duster contact roller** for chunks, dents, or brittleness and inspect **hardware** for wear and replace as needed.

8. Inspect **duster up/down switches** for damage and replace if needed.

9. Inspect **dispersion roller** for damage, check chain tension and repair, replace, or adjust if needed.

10. Remove **cleaner spray nozzles** and **check valve filters.** Clean all by soaking in a distilled white vinegar for 30 minutes, rinse with warm water and blow out with compressed air.

WARNING! Wear safety glasses when using compressed air. Place a cloth under the spray tip assembly to absorb residual fluid that may drip when removing tips.

11. Inspect **traction drive chain** alignment and tension and adjust if needed.

GUI MAINTENANCE MESSAGES

The GUI will generate Warning messages when counters expire for specific components listed in the "Diagnostics - Counters". Each component has an expected "life" it should achieve before it should be replaced. Keep in mind that lanes with surface issues and environments that are very dirty can accelerate wear. For each lane that is run, once a counter has expired, the GUI will display the warning message until the component is replaced or cleaned, and the counter is reset. The warning message will always appear "Warning: A hardware counter has expired…" Refer to Figure 6-7.

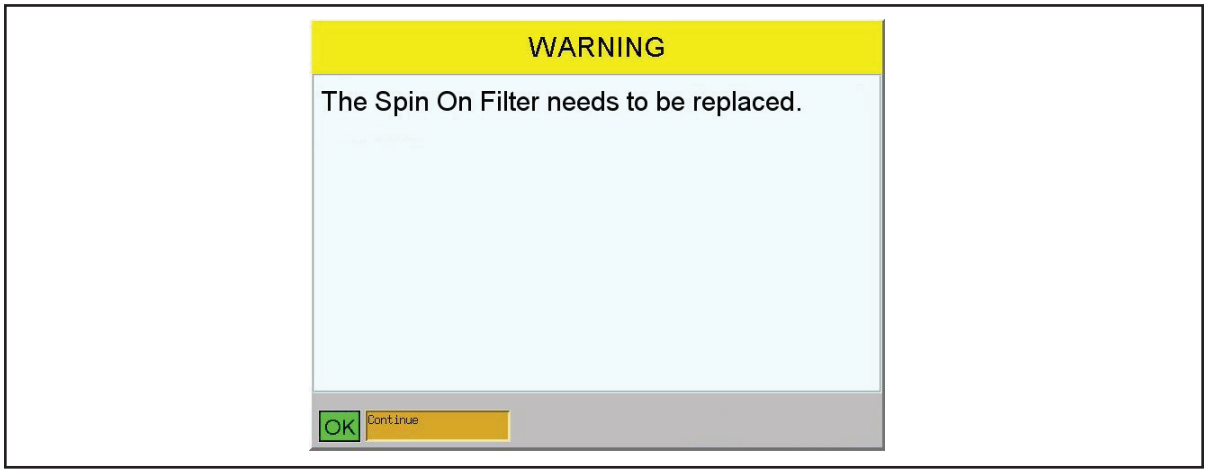


Figure 6-7. GUI Maintenance Messages

Below is a list of all the counters and the expected life (in lanes or in hours) for each component monitored by the GUI. Refer to *Section 4 - Maintenance Counters* for instructions on resetting a counter.

NOTE: *The Spin-on filter is recommended to be replaced after 29,200 lanes; however, it should also be replaced whenever switching brands of lane conditioner.*

NOTE: *Inspect and rotate the squeegee absorbent wipe and urethane blade to place the opposite edge in use every 3 months or 5,000 lanes. Replace if needed.*

Quick-list of Maintenance Counters

Buffer Lanes	29,200 lanes
Squeegee Lanes Replace	14,600 lanes
Duster Lanes	700 lanes
Oil Filter Lanes	29,200 lanes
Cleaner Filter Lanes	29,200 lanes
Spin-On Filter Lanes	29,200 lanes
Absorbent Wiper Lanes Replace	5,000 lanes
Drive Motor Hours	5,000 hours
Vacuum Motor Hours	500 hours
AGM Battery	400 cycles
Lithium Battery	1,600 cycles
Lane Length	As Needed

The Cleaning System

Using the Squeegee/Buffer Adjustment Tool

The Envoy is equipped with its own adjustment tool for measuring the height of the squeegee and the buffer brush. The adjustment tool is mounted inside the lane machine between the electronic enclosure and the center compartment wall separating the cleaning section from the center compartment. It is fastened by two wing nuts. Refer to Figure 6-8. The adjustment tool has three notches used to verify adjustments. The squeegee uses the 1/8” notch only while the buffer brush may use all three notches (1/8”, 3/16”, and 1/4”). To properly use the Squeegee/Buffer Brush adjustment tool, position so it spans the rear shaft wheel and the traction drive wheel on one side of the machine and then the opposite side. The notches should align with the squeegee and buffer brush so they are spanning the assembly. Refer to Figure 6-9.

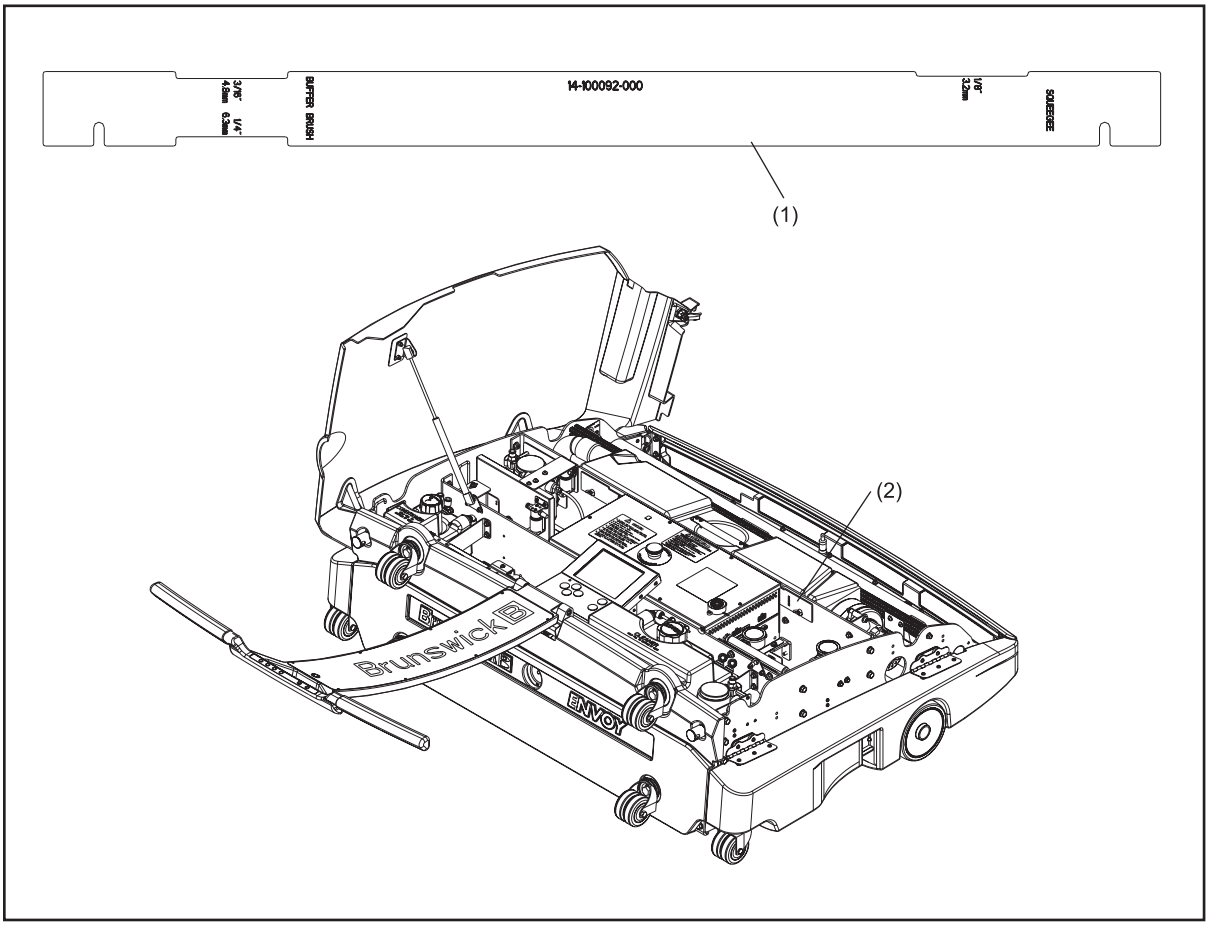


Figure 6-8. Adjustment Tool Storage Location

(1) SQUEEGEE/BUFFER ADJUSTMENT TOOL

(2) ADJUSTMENT TOOL STORAGE LOCATION

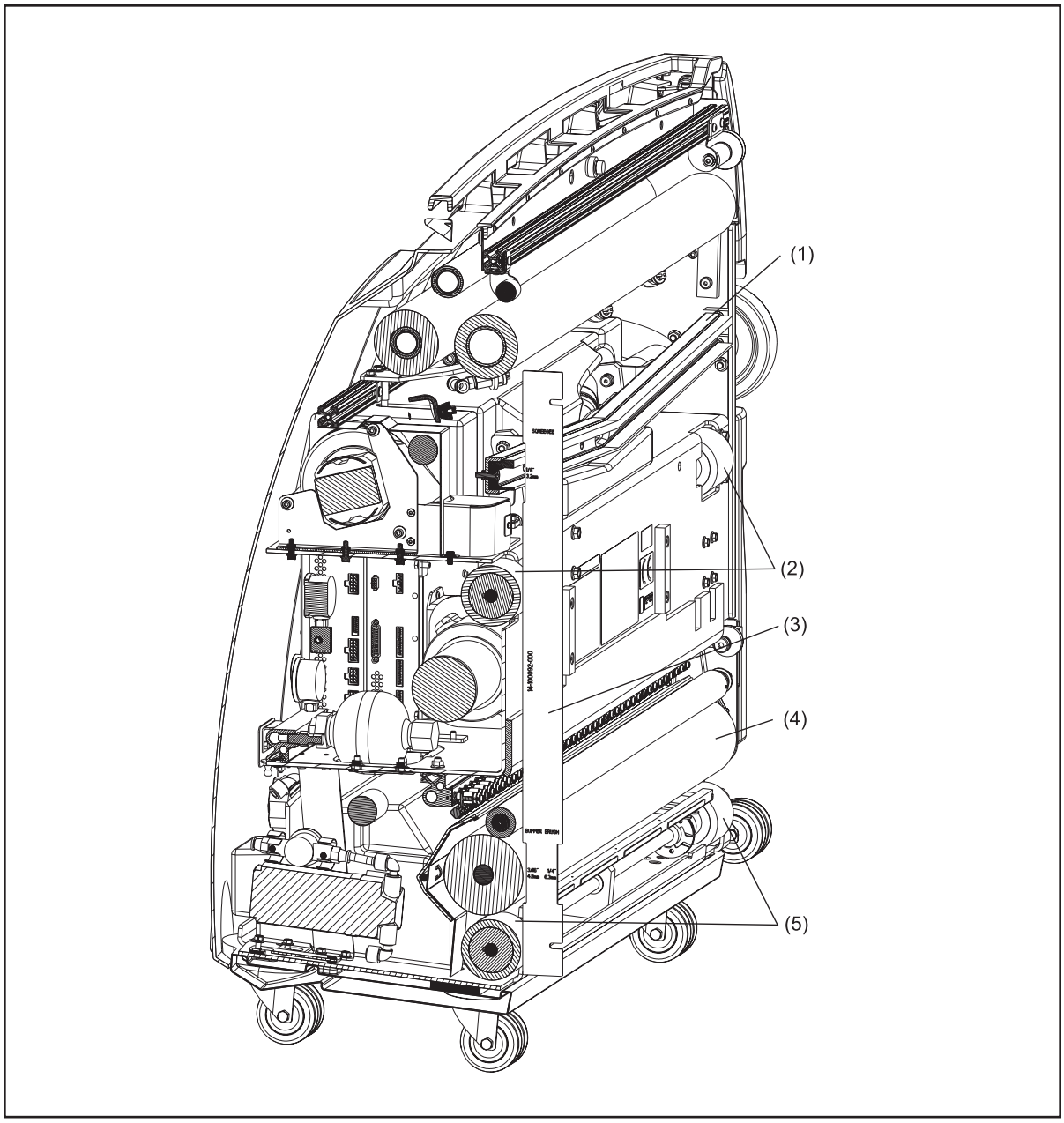


Figure 6-9. Using the Adjustment Tool - Section View

(1) SQUEEGEE HEAD ASSEMBLY
(2) TRACTION WHEELS
(3) SQUEEGEE/BUFFER ADJUSTMENT TOOL
(4) BUFFER BRUSH
(5) REAR SHAFT WHEELS

NOTE: **Refer to the *Adjusting the squeegee blade height*** *and* ***Adjusting the buffer brush height*** *in this section.*

Replacing the Duster Cloth

Parts needed: new duster cloth supply roll

1. With the machine on the approach and in the Operating Position, open the covers.

2. Grasp the lower duster cloth take-up roll (the full one in front) and push it to your right to compress the spring loaded hub.

3. Lift the duster cloth take-up roll towards you and remove from the lane machine.

4. Tip the duster cloth take-up roll to allow the metal stiffener tube to slide out of the duster cloth take-up roll core. Set the metal stiffener tube aside and dispose of the duster cloth take-up roll and core.

5. Remove the empty duster cloth supply roll core from the top position by following the same process as in 2 & 3 above. Keep the metal stiffener tube with the empty duster cloth supply roll core.

6. Insert the metal stiffener tube from the duster cloth take-up roll core into the new supply roll core and install the new duster cloth supply roll in the upper supply roll position on the machine.

7. Unwind several feet of cloth and route it through the duster system as shown on the routing decal. This decal should be located on the left side wall of the machine (7 pin side) in the area of the supply roll hub.

8. Drape the loose end of the duster supply cloth over the top of the waste recovery tank and onto the electronics enclosure.

9. Remove the paper backing from the unused strip of double sided tape on the old duster cloth supply core.

10. Lay the core, adhesive side down, across the duster supply cloth between the waste recovery tank and the electronics enclosure. Care should be taken to keep the core at a straight 90 degree angle to the cloth.

11. Wind the duster cloth over the top of the old duster cloth supply core as shown on the routing decal.

12. With at least two full winds on the old duster cloth supply core, install it into the lower, duster cloth take-up roll position in the front of the machine.

13. From the Operators screen, use the left/right arrows to highlight the Change Duster Cloth button in the lower, center of the screen and press OK.

14. The GUI will prompt you on how to correctly wind up the slack duster cloth. This process will also automatically reset the duster cloth counter in the maintenance screen.

15. Close the covers and resume operation of the machine.

Adjusting the Duster Clutch

Tools needed: 3/16” Allen wrench, 3/8” open end wrench

CAUTION! To prevent damage to duster gear motor, do NOT force motor to turn by rotating shaft or chain.

1. Lower the duster cloth using the “duster unwind” button in the GUI diagnostics for cleaning, then wind the cloth up, using the “duster wind” button. The motor should lift the duster contact roller to its raised position and then advance ~ 1/2” of new cloth.

2. Once the motor quits turning, the clutch on the duster cloth supply roll and duster motor on the duster cloth take-up roller should maintain their position. Press down firmly on the raised duster contact roller with the fingertips of both hands to check for proper adjustment of the duster clutch.

3. If the duster does not remain in the raised position after trying to press down, the duster clutch needs to be adjusted. To increase torque, use a 3/16” wrench and loosen the collar bolt.

4. Hold the supply roll of cloth to keep the threaded inner drive post of the clutch stationary during this adjustment. Use the 3/16” Allen wrench as a lever to rotate the outer clutch collar clockwise in steps of ¼ turn (90 degrees). Then retighten the collar bolt with the 3/16” Allen wrench to hold this setting.

5. Next, check to make sure that the duster clutch is not tightened too tightly to advance new duster cloth. Lower the duster cloth using the “duster unwind” button in the GUI diagnostics for cleaning. Then wind the duster cloth using the “duster wind” button. The load on the duster cloth motor should increase and turn more slowly when the supply roll of cloth turns (causing the duster clutch to slip). At least ¼” of new cloth should be unrolled from the supply roll.

6. If the duster cloth motor stalls before it advances at least ¼” of new cloth OR if it reverses direction or “back lashes” after the duster cloth motor stops turning, then there is too much torque on the duster clutch. To decrease torque, use a 3/16” Allen wrench to loosen the collar bolt.

7. Hold the supply roll of cloth to keep the threaded inner drive post of the clutch stationary during this adjustment. Use the 3/16” Allen wrench as a lever to rotate the outer clutch collar counter-clockwise in steps of 1/8 turn (45 degrees). Then retighten the collar bolt with the 3/16” Allen wrench to hold this setting.

8. Repeat steps 1-7 to verify the proper duster clutch adjustment.

Adjusting the Down Stop for the Duster Contact Roller Pivot-Arm

Tools needed: 3/16” allen wrench, 7/16” Open-end wrench:

Refer to Figure 6-10.

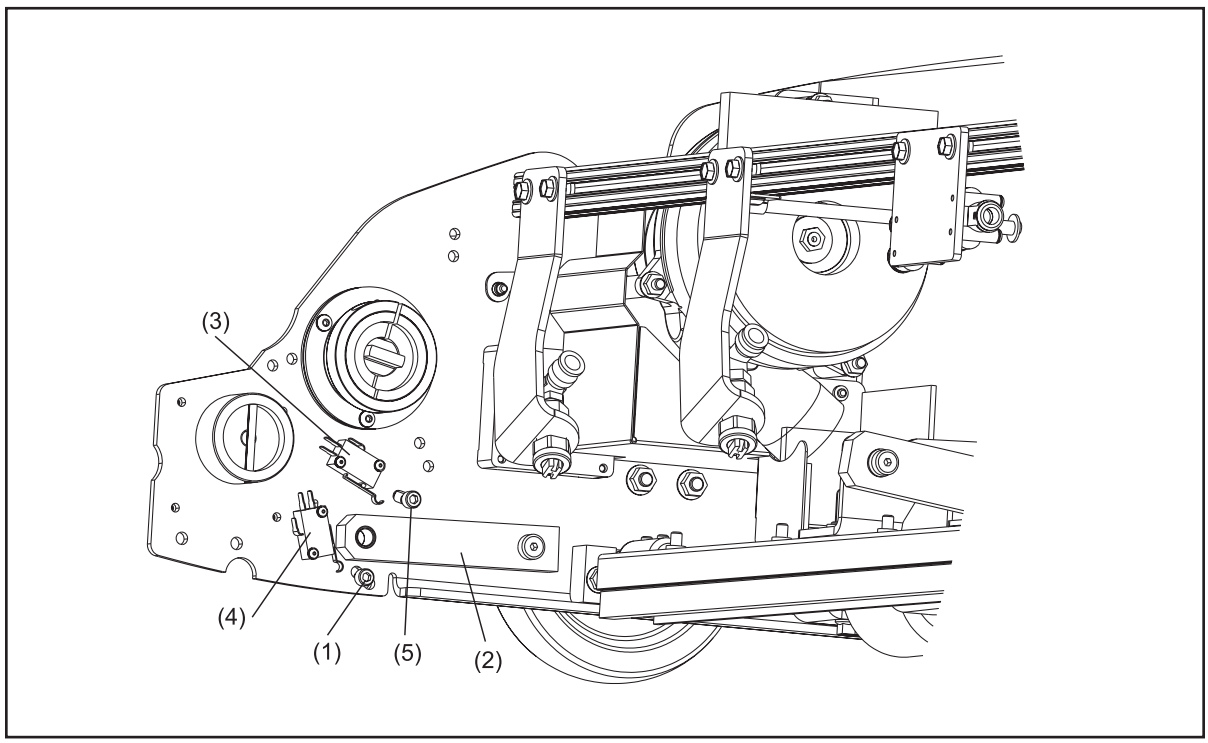


Figure 6-10. Adjusting Down Stop

(1) DUSTER CONTACT ROLLER DOWN STOP BOLT
(2) DUSTER CONTACT ROLLER PIVOT ARM
(3) DUSTER UP SWITCH
(4) DUSTER DOWN SWITCH
(5) DUSTER CONTACT ROLLER UP BOLT

1. Place the machine in transport position with the power off.

2. Locate the duster contact roller down stop bolt below the pivot arm of the contact roller.

3. Loosen the bolt using a 3/16” allen wrench and 7/16” open-end wrench and move the stop bolt up or down in the slotted hole to adjust the position of the stop. The stop bolt should be located in the center of the adjustment slot on both the 7 and 10-pin sides.

Adjusting the Up Stop for the Duster Contact Roller Pivot-Arm

Tools needed: 3/16” Allen wrench, 7/16” Open-end wrench

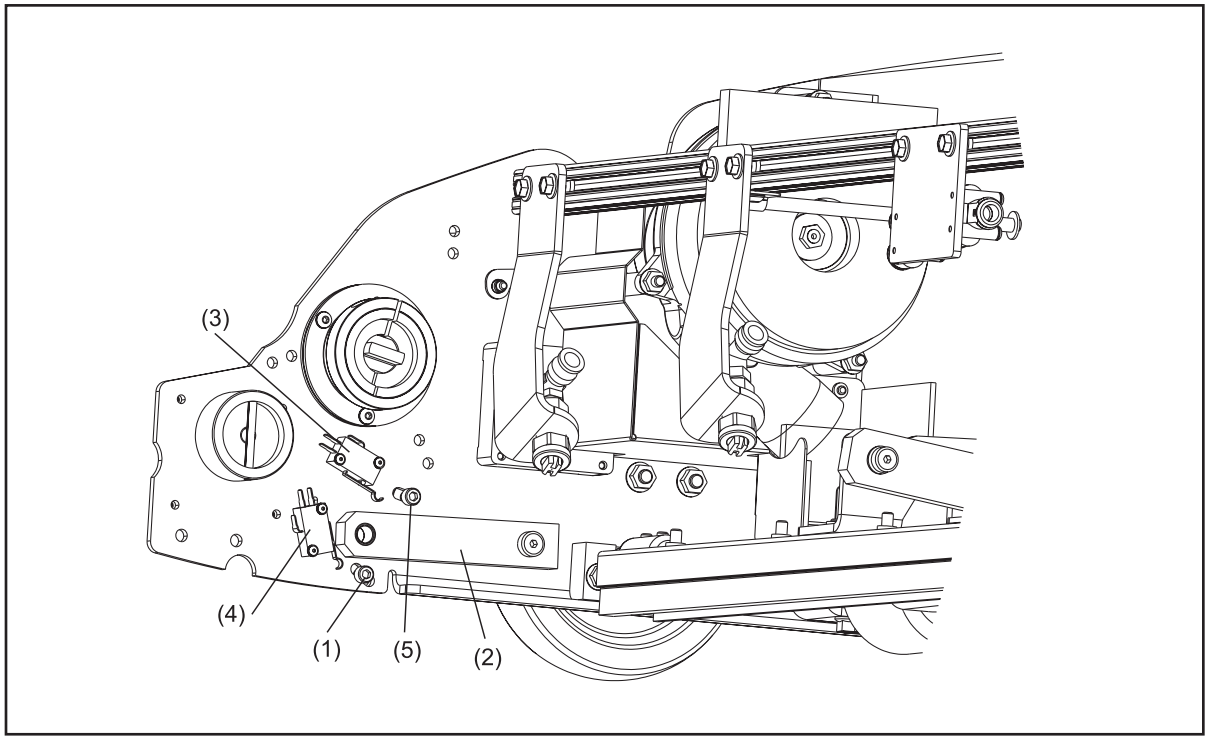


Figure 6-11. Adjusting Up Stop

(1) DUSTER CONTACT ROLLER DOWN STOP BOLT
(2) DUSTER CONTACT ROLLER PIVOT ARM
(3) DUSTER UP SWITCH
(4) DUSTER DOWN SWITCH
(5) DUSTER CONTACT ROLLER UP BOLT

1. Place the machine in the transport position with the power off.

2. Locate the duster contact roller up stop bolt above the pivot arm of the contact roller.

3. Loosen the bolt using a 3/16” allen wrench and 7/16” open-end wrench and move the stop bolt up or down in the slotted hole to adjust the position of the stop.

4. The stop bolt should be located so that when the duster contact roller pivot arm is against the up stop bolt it allows the up switch to be completely engaged, but does not push the arm of the up switch past the switch body. Refer to Figure 6-11.

Replacing the Duster Up/Down Switches

Tools needed: 1/8” allen wrench, 1/16” allen wrench, 1/4” open-end wrench.

Parts needed: duster up or down switch (Part Number 11-616025-000).

Refer to Figure 6-9.

1. Place the machine in transport position with the power off and open the cover.
2. Remove the side cover on the 10-pin side of the machine by removing the locator pins.
3. Identify the faulty switch.
    a. The duster “up” switch is in mounted in an adjustable slot, up and behind the duster contact roller when the machine is in transport position.
    b. The duster “down” switch is mounted in an adjustable slot and is visible from below the duster contact roller.
4. Move the duster cloth out of the way in order to access the switches.
5. Remove the duster up/down switch by removing the 2 mounting screws with the 1/4” wrench and 1/16” allen wrench and disconnecting the wires from the fast-on connectors.
6. Transfer the wires from the old duster up/down switch to the new switch.
7. Replace wires following the same wiring pattern as the original switch:
    a. Up switch wiring: white = common, green = n.o. (normally open).
    b. Down switch wiring: blue = common, brown = n.o. (normally open).
8. Remount duster up/down switch.
9. Verify the placement of the duster down switch.
    a. The switch should begin to engage when the contact roller pivot arm is contacting the down stop.

NOTE: The duster down switch should indicate the down position in the cleaner diagnostics when the duster cloth motor is lowered with the lane machine in the operating position on the approach, when it is resting against the down stop for the contact roller pivot arm. When the lane machine is pushed on the front of the lane, the lane should push the contact roller up slightly so the duster down switch is no longer engaged.

    b. Loosen the screw and adjust the position of the switch until it is correct.

10. Verify the placement of the duster up switch.

    a. The switch should be engaged when the contact roller pivot arm is against the up stop.

    b. Loosen the screw and adjust the position of the switch until it is correct. Do not allow the pivot arm to push the up switch arm past the body of the switch.

11. Replace the duster cloth.

12. Replace the side cover.

Adjusting the Squeegee Blade Height

Tools needed: Buffer/Squeegee adjustment tool, 10” #2 Phillips screwdriver.
(Part Number 11-112133-000 included with spare parts package).

Adjustment: 1/8” notch on buffer/squeegee adjustment tool.

Refer to Figure 6-12.

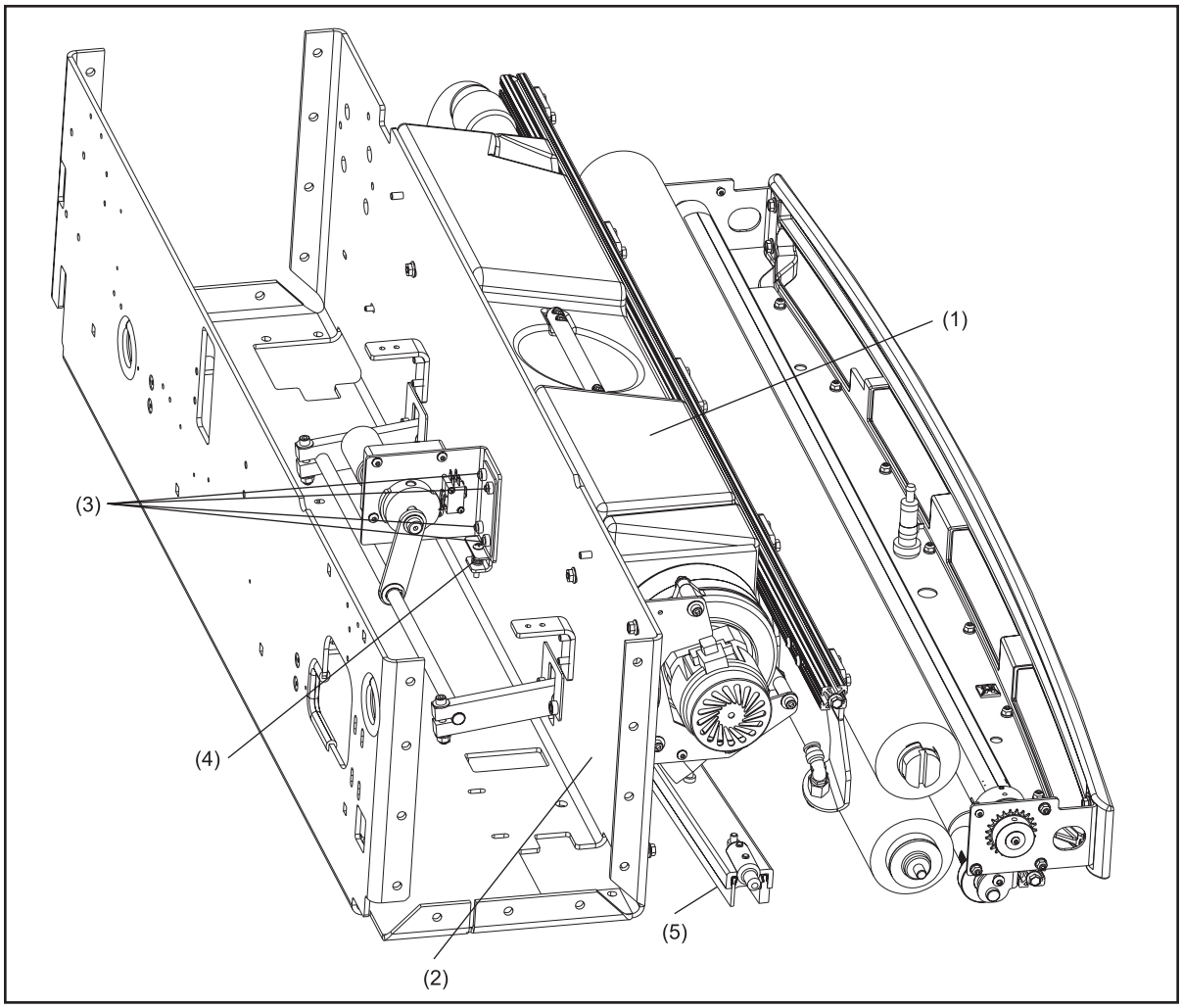


Figure 6-12. Adjusting Squeegee Blade Height

(1) WASTE RECOVERY TANK
(2) FRONT FRAME DIVISION WALL
(3) FLAT HEAD BOLTS
(4) PLATE ADJUSTING SCREW
(5) SQUEEGEE BLADE

1. Place machine in operating position covers open and the power supply on.

2. Go to the “Cleaner Diagnostics” screen in the “Maintenance” menu of the GUI.

3. Lower the squeegee head so the sensor shows the squeegee is down.

4. Turn off power to the machine.

5. Lift the machine into the transport position and measure the height adjustment using the buffer/squeegee adjustment tool for the initial appropriate adjustment. (Refer to the beginning of this section “Using the buffer/squeegee adjustment tool”).

6. If an adjustment is needed open the covers and remove the waste tank, loosen but do not remove the 4 flat head bolts on the front frame division wall of the machine.

7. Using the 10” Phillips screwdriver on the plate adjusting screw, raise or lower the adjusting plate so the front edge of the blade contacts the lane surface. Turning the adjustment screw clockwise will lower the squeegee blade while turning the screw counter clockwise will raise the squeegee blade.

    a. If it’s too high, the bottom of the squeegee blade will not contact the 1/8” notch surface of the buffer/squeegee adjustment tool.

    b. If it’s too low, the front face of the squeegee blade will contact the 1/8” notch surface of the buffer/squeegee adjustment tool with some deflection of the blade.

8. Tighten the 4 flat head bolts.

9. Lower the lane machine into the operator position and open covers.

10. Place the machine on the lane surface.

11. Visually check the squeegee for even deflection away from the vacuum head. If the squeegee blade is not evenly deflected from side to side, loosen the two bolts on one of the squeegee are pivots on the front frame division wall. Adjust the pivot up or down for even side-to-side deflection of the squeegee blade and then tighten the pivots bolts.

12. The squeegee blade needs a 45-degree angle of deflection across the entire squeegee blade. If an adjustment is needed, restore power to the machine and use the cleaner diagnostic screen to raise the squeegee. Loosen, but do not remove, the 4 flat head bolts on the front frame division wall of the machine.

13. Using the 10” Phillips screwdriver on the plate adjusting screw, raise or lower the adjusting plate so the front edge of the blade contacts the lane surface at about a 45 degree angle. Lower the squeegee and push the machine forward on the lane.

    a. If it’s too high, the bottom of the squeegee blade will just contact the lane surface with very little deflection.

    b. If it’s too low, the front face of the squeegee blade will contact the lane surface with too much deflection (~90 degree angle).

14. Tighten the 4 flat head bolts.

15. Replace the waste recovery tank.

16. Test clean the lane.

Adjusting the Squeegee Blade Pitch

Tools needed: 3/8” open-end wrench, 7/16” open-end wrench.

Adjustment: slightly forward from center of the adjustment slot.

Refer to Figure 6-13.

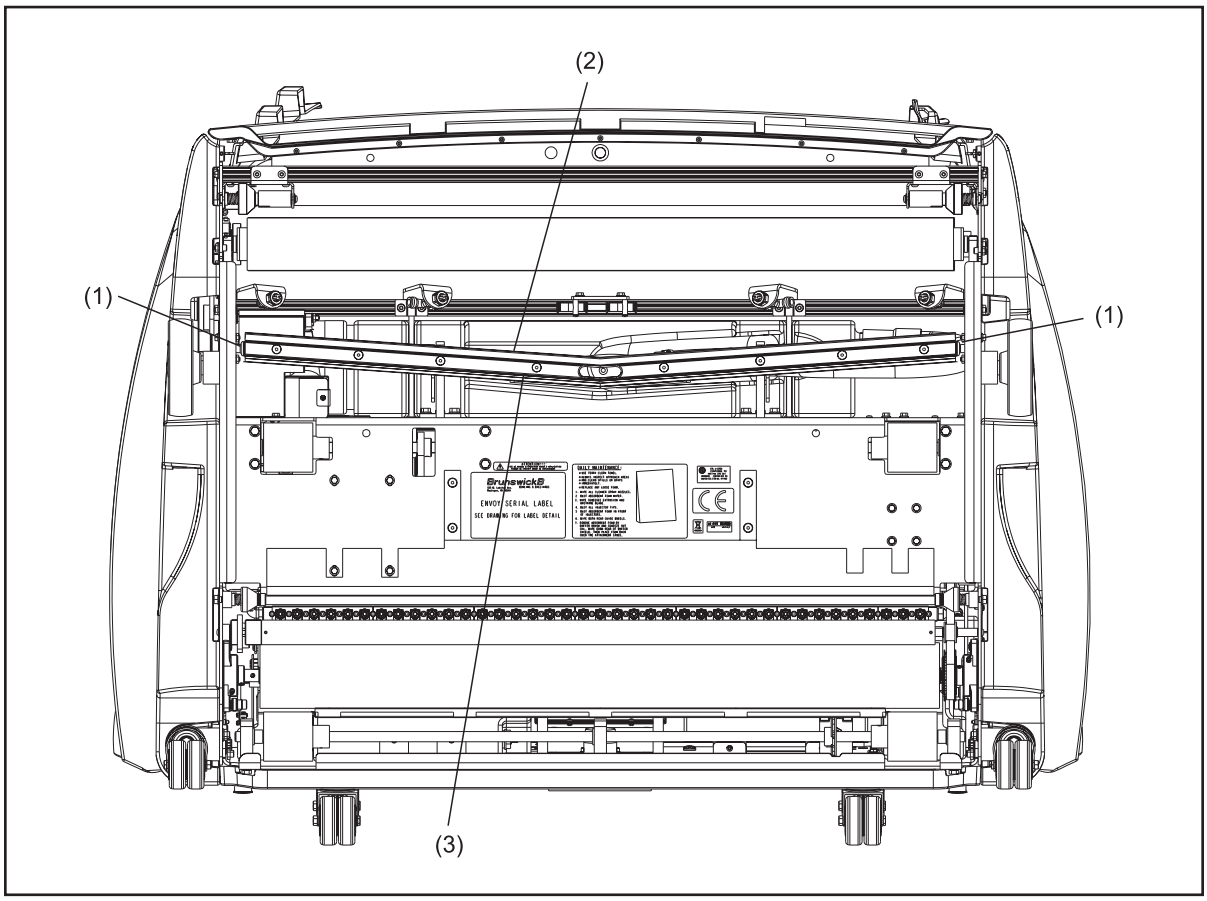


Figure 6-13. Adjusting Squeegee Blade Pitch

(1)	SQUEEGEE ADJUSTMENT GUIDE BLOCKS	(2)	ABSORBENT WIPER
		(3)	SQUEEGEE BLADE

1. Place machine in operating position covers open and the power supply on.

2. Go to the “Cleaner Diagnostics” screen in the “Maintenance” menu of the GUI.

3. Lower the squeegee head so the sensor shows the squeegee is down.

4. Turn off power to the machine.

5. Loosen, but do not remove, the two mounting bolts for each the squeegee adjustment guide blocks on the 7 and 10-pin sides.

6. Adjust the guides.

   a. Moving the guides towards the front of the machine forces more pressure on the center of the squeegee blade (for lane depressions).

   b. Moving the guide blocks towards the rear of the machine releases pressure from the center of the squeegee blade (for crowning lanes) and applies more pressure to the absorbent wiper.

7. Tighten the bolts for the squeegee adjustment guide blocks. Verify the squeegee has some play to pivot forward and backward and is not binding in the guide blocks.

8. Remove the cleaner waste recovery tank.

9. Place the machine on the lane surface.

10. Visually check the squeegee for even deflection away from the vacuum head.

NOTE: It may be necessary to perform the squeegee height adjustment after making the pitch adjustment.

11. Replace the waste tank.

12. Restore power to the machine and test clean the lane.

Replacing the Absorbent Wiper And Squeegee Blade

Refer to Figure 6-13.

Tools Needed:
- 3/16” Allen wrench
- 1/2” Open end wrench
- 5/32” Allen wrench

Parts Needed To Rotate Existing Absorbent Wiper or Squeegee
New Absorbent Wiper, part number 14-100556-000, included with spare parts package.
New Squeegee Blade part number 14-100523-000

1. Put machine in transport position.

2. Open covers and remove cleaner waste recovery tank.

3. Remove the two shoulder pivot bolts for the squeegee head using 3/16” allen wrench and 1/2” wrench on hex nuts.

4. Take the vacuum head to a work table and remove the hose.

5. Remove all 8 button head cap screws with a 5/32” Allen wrench from inside the vacuum head and gently pry up the inner retaining channel and remove.

6. Remove and replace the absorbent wiper blade or rotate the blade depending on the blade usage.

NOTE: *The absorbent wiper blade and the squeegee blade are designed to be flipped so that you receive at least two uses of each blade.*

7. Check the squeegee blade for wear, flip and reuse, or replace as required.

8. Place the inner retaining channel in-between the absorbent wiper blade and the squeegee blade.

9. Using the screws removed in step #5 above (the inside end of each inner channel uses the shorter screw), start on the outside end and gently work the retaining channel down as you tighten the bolts.

NOTE: *Make sure the retaining channel does not pull the blade down under the retainer. Both the absorbent wiper and squeegee blade should be straight across the width of the vacuum head after tightening.*

10. Replace the hose and reinstall the squeegee head in the lift arms using the two shoulder type bolts.

11. Verify correct adjustment of the squeegee blade height per this manual.

NOTE: *The wiper is two sided and after one side has reached the end of its useful life, rotate the wiper to place the opposite edge in use. Expected life is 1 – 3 months per side for a 40 lane bowling center; however, the wear is dependent on use and the condition of the lane surface.*

NOTE: *The squeegee blade is two sided and after one side has reached the end of its useful life, rotate the squeegee blade to place the opposite edge in use. Expected life is 3 – 6 months per side for a 40 lane bowling center; however, the wear is dependent on use and the condition of the lane surface.*

Replacing the Squeegee Up/Down Switches

Tools needed: 1/16” allen wrench, 3/8” socket wrench with extension.

Parts needed: replacement switches (Part Number 11-616026-000).

Refer to Figure 6-14.

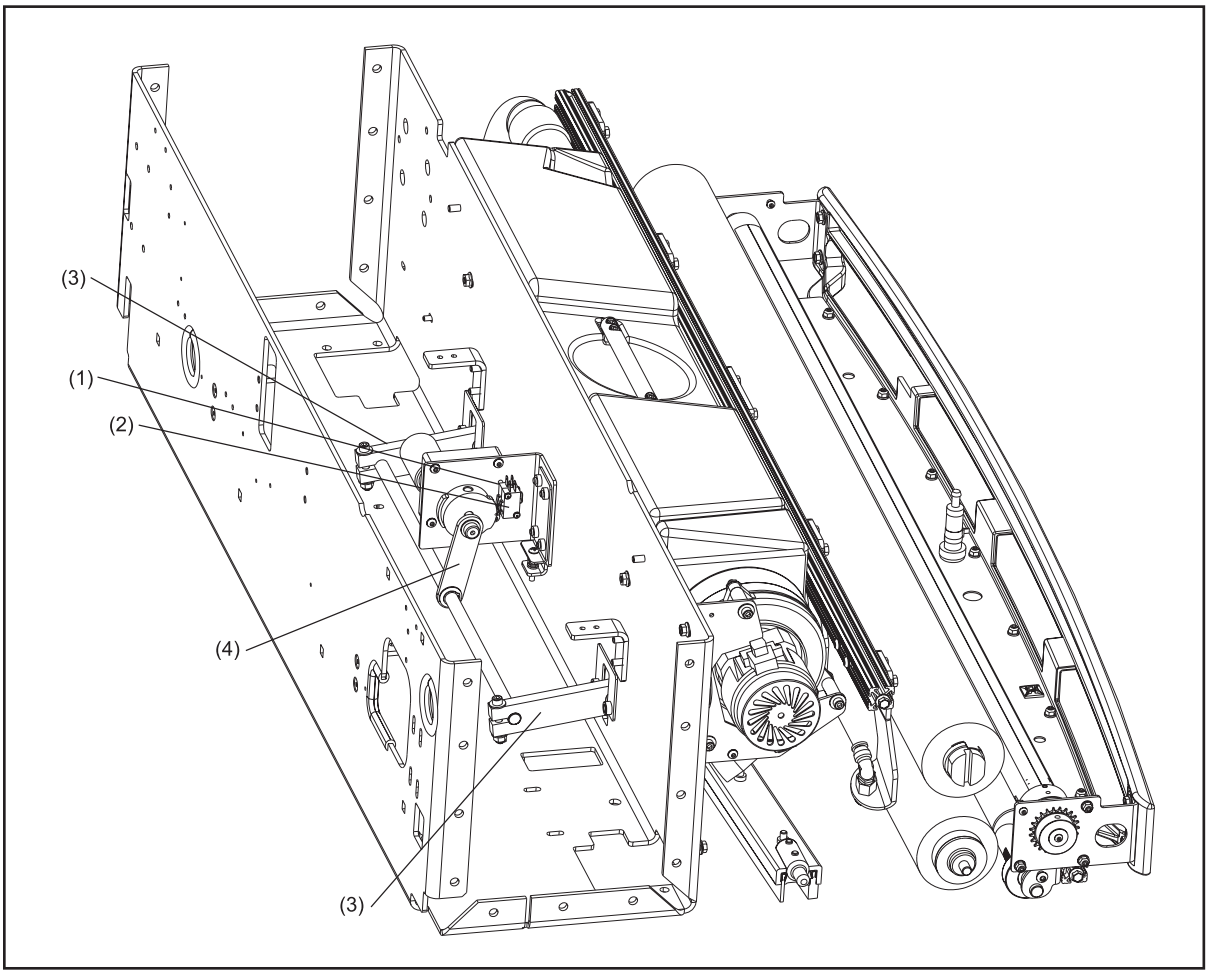


Figure 6-14. Replacing Squeegee Up/Down Switches

(1) SQUEEGEE UP SWITCH
(2) SQUEEGEE DOWN SWITCH
(3) SQUEEGEE PIVOT ARMS
(4) SQUEEGEE LIFTING LINKAGE

1. Place machine in operating position with the power supply disconnected and open the cover.
2. Remove the electronic enclosure and set aside using this process:
    a. Disconnect all cables from the sides and rear of the enclosure.
    b. Loosen and remove 4 bolts that secure electronic enclosure to mounting brackets.
    c. Remove and set aside.

CAUTION!

Do not use emergency stop button as a handle to lift enclosure

3. Disconnect switch cables at connector plug, leaving the wires on the switches.

4. Remove the 2 screws that secure the switch to the mounting bracket using a 1/16" allen wrench.

NOTE: *The up/down switches are mounted back to back on the bracket and can be distinguished by the color of their wires; the "up" switch has green and white cables, the "down" switch has blue and black cables.*

5. Remove switches.

6. Replace faulty switch.

7. Reconnect cables using the fast-on cable connectors.

8. Position switches on mounting bracket and replace and tighten screws that secure switches to the bracket.

NOTE: *Position switches as close to the cam as possible to ensure good contact with switches.*

9. Connect Cable plug to harness.

10. Position the electronics enclosure in place, replace and tighten bolts that secure the electronic enclosure to mounting brackets, and reconnect all cables.

Lubricating the Squeegee Lifting Assembly

Refer to Figure 6-14.

1. Apply one drop of oil to each side of the bearings on the squeegee pivot arm.

2. Apply one drop of oil to the bearings on the squeegee lifting linkage connected to the cam for the lifting motor and to the shaft connecting both squeegee pivot arms. The squeegee blade is two sided and after one side has reached the end of its useful life, rotate the squeegee blade to place the opposite edge in use. Expected life is 3 – 6 months per side for a 40 lane bowling center; however, the wear is dependent on use and the condition of the lane surface.

Draining the Cleaner Supply Tank

Tools needed: None.

Parts needed: Drain tubing found in the spare parts kit, spare container.

Refer to Figure 6-15.

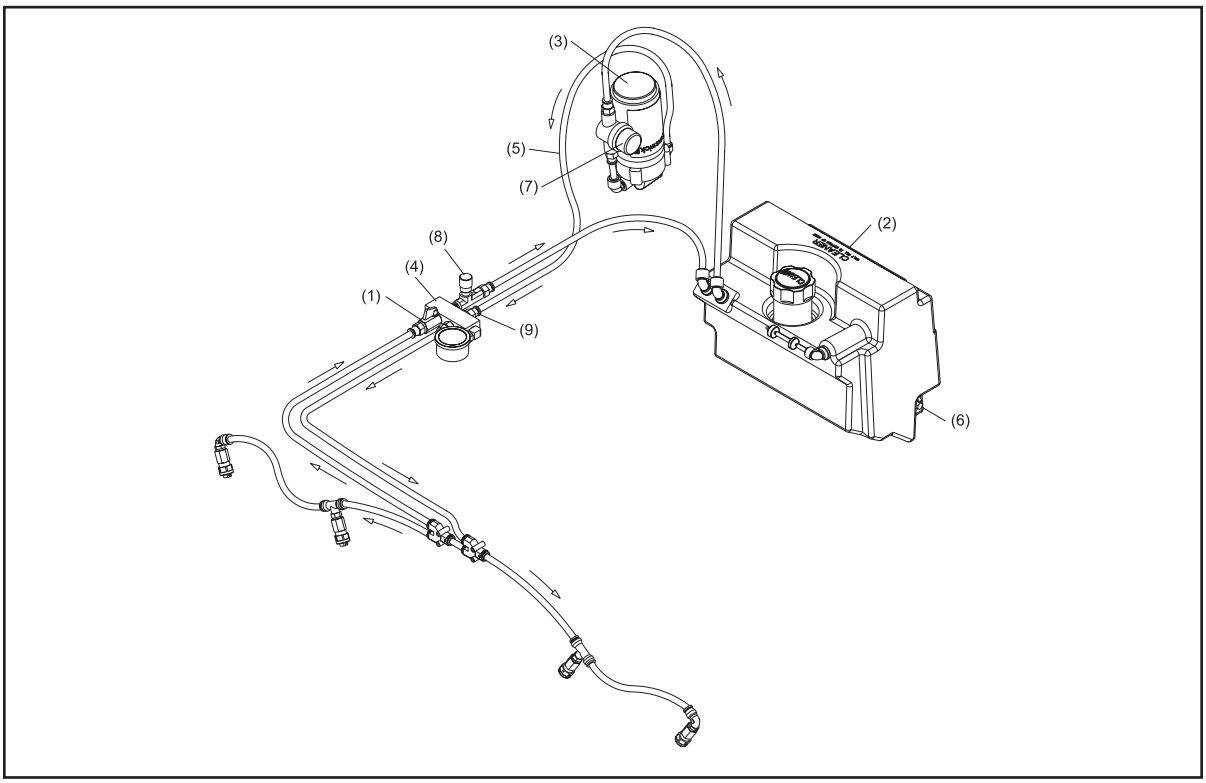


Figure 6-15. Draining the Cleaner Supply Tank

(1) CLEANER SHUT OFF VALVE
(2) CLEANER SUPPLY TANK
(3) CLEANER PUMP
(4) CLEANER MANIFOLD
(5) SUPPLY TUBING
(6) CLEANER LEVEL FLOAT SENSOR
(7) CLEANER SCREEN FILTER
(8) PRESSURE CONTROL VALVE
(9) DISCONNECT TO USE DRAIN TUBE

1. Place the machine in the operator position and supply power.
2. Place a rag underneath the cleaner manifold.
3. Disconnect the supply tubing from the left hand (7-pin side) top position of the cleaner manifold assembly. Refer to number (9) in Figure 6-15.
4. Attach the drain tubing with the 3/8” elbow union to the supply tubing removed in step 3.
5. Route the drain tubing into a container and hold in place.
6. Go to Cleaning Diagnostics and turn on the cleaner pump.
7. Continue to run pump until cleaner has been completely drained.
8. Remove the drain tubing and reconnect the supply line to the manifold.

IMPORTANT!: *It is very important to make sure the tubing is not damaged and that it is inserted completely into the fitting.*

Replacing the Level Float Sensor in the Cleaner Supply Tank

Refer to Figure 6-15.

Tools needed: 3/8” open ended wrench or socket, 1” open ended wrench

Parts needed: Replacement Level Float Sensor (Part Number 14-100942-000)

1. Drain the cleaner supply tank. (Refer to draining the cleaner supply tank at the beginning of this section.).
2. Place the machine in transport position with the power supply disconnected.
3. Disconnect cable from level float sensor (push down and away on tab to disconnect).
4. Disconnect tubing from tank, loosen two mounting bolts and remove tank.
5. Remove faulty sensor from the tank using a 1” and 3/8” wrench, turning counter-clockwise to loosen the sensor compression nut.
6. Insert the new sensor with the indicator pointing toward the top of the tank and tighten.

NOTE: *Sensor is correctly positioned if the white float hangs down toward the bottom of the tank when machine is in operating position.*

7. Replace tank in machine, tighten mounting bolts and replace tubing.
8. Reconnect sensor cable.
9. Fill the cleaner supply tank to verify that there is no leaking from around the new cleaner level float sensor.

Replacing/Cleaning the Cleaner Screen Filter

Parts needed: Cleaner filter - screen only, 40-mesh, part number 11-655024-004 or complete filter assembly with fittings, part number 14-100478-000.

Tools needed: spare container, 3/8” open ended wrench or socket.

Refer to Figure 6-15.

1. Place machine in operating position with covers open.
2. Disconnect power to the machine and the power and ground cables attached to the Cleaner Pump.

3. Slowly disconnect the tubing from the top of the filter. Once air is introduced into the tubing the cleaner will flow back into the tank.

4. Loosen the two bolts at the top of the pump and filter assembly that secure it to the rear frame and lift out the cleaner pump and filter bracket.

5. Disconnect the tubing from the pump outlet fitting (to the cleaner manifold). Move the pump and filter bracket to a workbench.

6. Place a container under the strainer bowl to catch any remaining cleaner and unscrew the bowl on the mesh strainer.

7. Clean the filter/strainer by running under water or replace, if necessary. (filter only p/n 11-655024-004)

8. Replace strainer and bowl, take care to ensure the strainer is on straight, not crushed, and the bowl gasket is properly positioned around the entire groove of the filter body.

9. Reconnect the supply tubing as you replace the pump and filter bracket in the machine, tighten the bolts.

10. Reconnect the pump power and ground cables, and restore power to the machine.

11. Place machine on the lane and turn on the cleaner pump via the "Cleaner Diagnostics" screen in the "Maintenance" menu of the GUI.

12. Test clean one or more lanes (as needed) to verify that all air has been purged from the cleaning system.

NOTE: To test the cleaning performance set the pattern to a "Clean" mode in the "Design", "Pattern Parameters" in the "Pattern" menu.

Adjusting the Cleaner Pressure

Refer to Figure 6-15.

Tools needed: none.

Adjustment: 17 - 19 psi.

1. Place the machine in the operator position and supply power.

2. Place the machine on the lane and open the two top covers.

3. Navigate to "Cleaning", "Diagnostics" in the "Maintenance" menu.

4. Select and "OK" both the Cleaner valve and Cleaner pump to observe the "Min" pressure setting.

5. Turn the pressure control valve knob on the cleaner manifold assembly, clockwise to increase the system pressure.

6. Turn the pressure control valve knob on the cleaner manifold assembly, counter-clockwise to decrease the system pressure.

7. Secure the pressure valve setting knob by tightening the top set screw.

Replacing the Vacuum Seal

Tools needed: single-edge razor blade.

Parts needed: New Vacuum Seal (Part Number 14-100487-000 included with spare parts package). Isopropyl Alcohol (Part number 61-869255-000)

Refer to Figure 6-16.

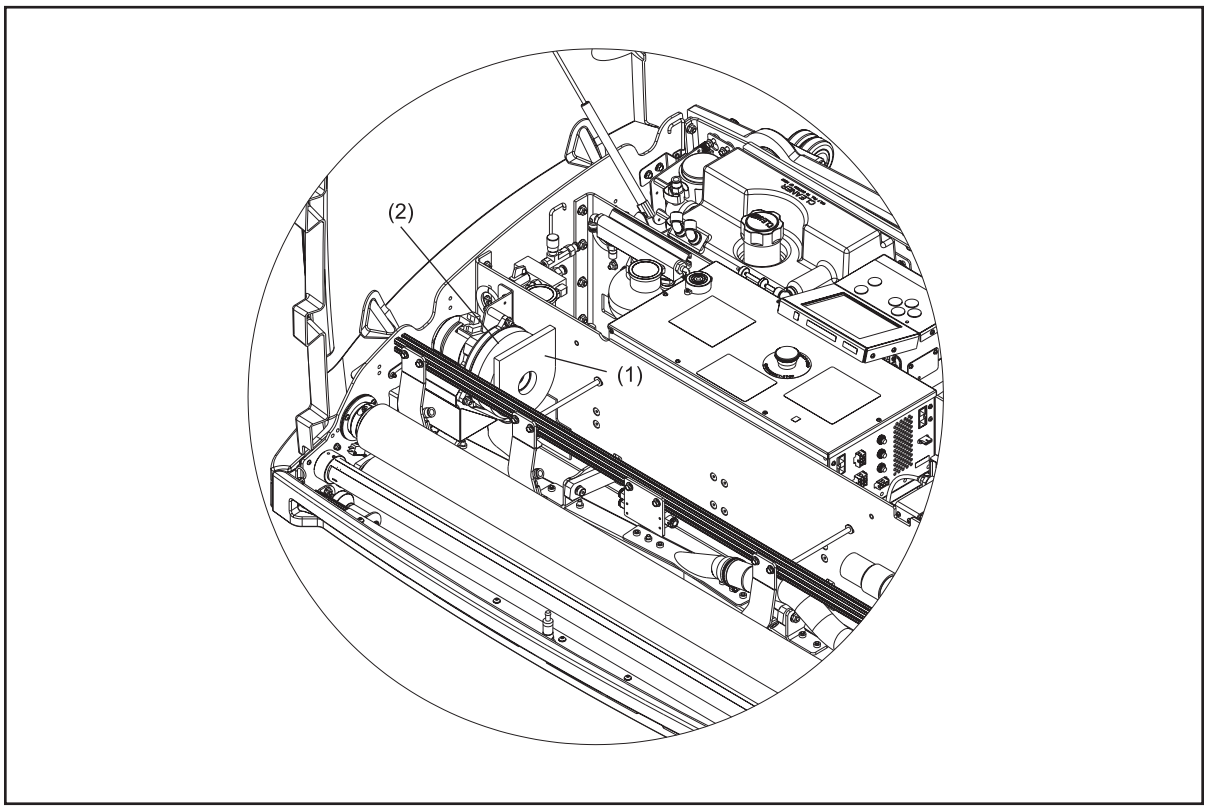


Figure 6-16. Replacing the Vacuum Seal

(1) VACUUM SEAL (2) VACUUM HOUSING

1. Place the machine in transport position with the power disconnected and the cover off.

2. Remove waste recovery tank.

3. Remove the old seal and carefully clean residue with isopropyl alcohol from vacuum housing.

4. Remove self-adhesive backing from new seal.

5. Attach new seal to vacuum motor housing, centering the seal over the hole in housing and aligning the flat edge of the seal with the top of the machine.

6. Inspect the 14-100378-000 Absorbent Foam Vacuum exhaust /deflector felt and 14-100104-000, 14-100105-000 and 14-100106-000 vacuum exhaust/deflector felt and replace as needed with 14-860222-000 adhesive.

7. Replace waste recovery tank.

NOTE: *Make sure that the vacuum motor assembly mounting bracket is positioned in the slots to provide even pressure between the vacuum housing and the waste recovery tank.*

The Conditioning System

Depressurizing the Conditioning System

Tools needed: None.

1. Enter the “Conditioning” sub menu in “Diagnostics”.

2. Navigate, using the left/right arrows, to the Vent valve and press “OK”.

3. Immediately navigate to the Pressure relief valve and press “OK”.

NOTE: *Each valve function will run for 20 seconds. It may be necessary to repeat steps “2” and “3” for a second time to fully depressurize the system so the pressure sensor reads 0.*

Draining the Conditioner Supply Tank

Tools needed: None.

Refer to Figure 6-17.

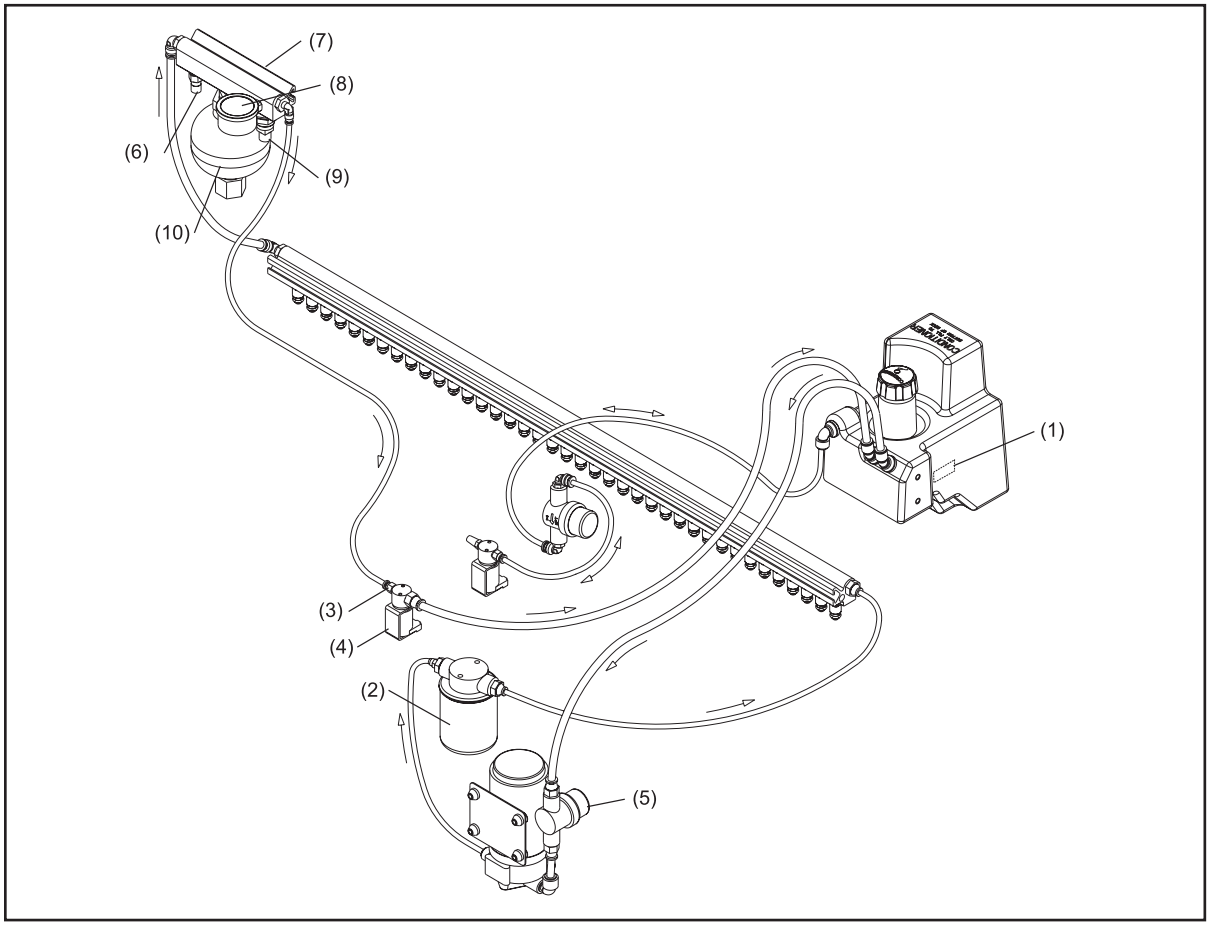


Figure 6-17. Replacing Level Sensor in Supply Tank

(1) CONDITIONER LEVEL FLOAT SENSOR
(2) CONDITIONER SPIN-ON FILTER
(3) DISCONNECT TO USE DRAIN TUBE
(4) CONDITIONER PRESSURE CONTROL VALVE
(5) CONDITIONER SCREEN FILTER
(6) CONDITIONER TEMPERATURE SENSOR
(7) ACCUMULATOR RAIL
(8) CONDITIONER PRESSURE GAUGE
(9) CONDITIONER PRESSURE SENSOR
(10) ACCUMULATOR

Parts needed: Drain tubing found in the spare parts kit, spare container.

1. Place the machine in the operator position and supply power.

2. Verify that there is no pressure within the conditioning system by viewing the sensor reading in the “Sensor” sub menu in the Maintenance diagnostics menu.

3. If the conditioning system is pressurized, refer to Depressurizing the conditioning system at the beginning of the Conditioning System section.

4. Locate the conditioner pressure control valve, in the center frame next to the conditioner pump, and place a terry towel under the valve fitting facing the10-pin side.

5. Remove the tubing, from the conditioner pressure control valve only, that extends to the accumulator rail assembly and attach the drain tubing supplied in the spare parts kit to the end of the tubing you just removed.

6. Route the drain tubing to a container.

7. Go to Conditioning Diagnostics and turn on the vent valve and oil pump.

8. Continue to run pump until the conditioner supply tank has been completely drained.

9. Remove the drain tubing and reconnect the tubing to the conditioner pressure control valve.

NOTE: *It is very important to make sure the tubing is not damaged and that it is inserted completely into the fitting.*

Replacing the Level Float Sensor in Conditioner Supply Tank

Tools Needed: 3/8" open ended wrench or socket

Parts needed: Replacement Level Float Sensor, part number 14-100942-000.

Refer to Figure 6-17.

1. Drain the conditioner supply tank. (Refer to draining the conditioner supply tank.)

2. Disconnect power to machine. Disconnect all tubing at conditioner tank.

3. Disconnect cable from level float sensor (push down and away on tab to disconnect).

4. Remove tank by loosening (2) support bolts and lifting tank.

5. Remove faulty sensor from the tank using a 1" and 3/8" wrench, turning counter-clockwise to loosen the sensor compression nut.

6. Insert the new sensor with the indicator pointing toward the top of the tank and tighten.

NOTE: *Sensor is correctly positioned if the white float hangs down toward the bottom of the tank when machine is in operating position.*

7. Replace tank into machine and tighten mounting bolts.

8 Reconnect sensor cable.

9 Reconnect tubing at tank.

10 Fill the conditioner supply tank to verify that there is no leaking from around the new level sensor.

Replacing the Conditioner Spin-On Filter

Tools Needed: Shop Towels, 3/4" Open End Wrench or 3/8" Drive 3/4" Socket and Ratchet, Standard Strap Filter Wrench – OEM Brand #25079 or equivalent (available at local automotive parts supplier).

Parts Needed: Replacement Spin-On Oil Filter, part #11-655029-001.

NOTE: *This procedure must be performed in the operating position with the covers open, push the machine out 24" past the foul line out onto the lane surface.*

WARNING! Before the filter is replaced the conditioner system must be drained and the Temperature Cycle must be turned OFF. Failure to do so may result in personal injury to the user and could also cause damage to the lane machine.

Step 1. Draining the Conditioning System

Refer to "Draining the conditioner tank" instructions.

Step 2. Removing the Spin On Oil Filter

1. Turn off power to the Envoy by the main power switch located on the 7-pin side cover.

2. Place a terry towel in the machine underneath the spin on filter. Remove the filter using the filter wrench and turn counter-clockwise to loosen. Drain and discard the used filter. Refer to Figure 6-18.

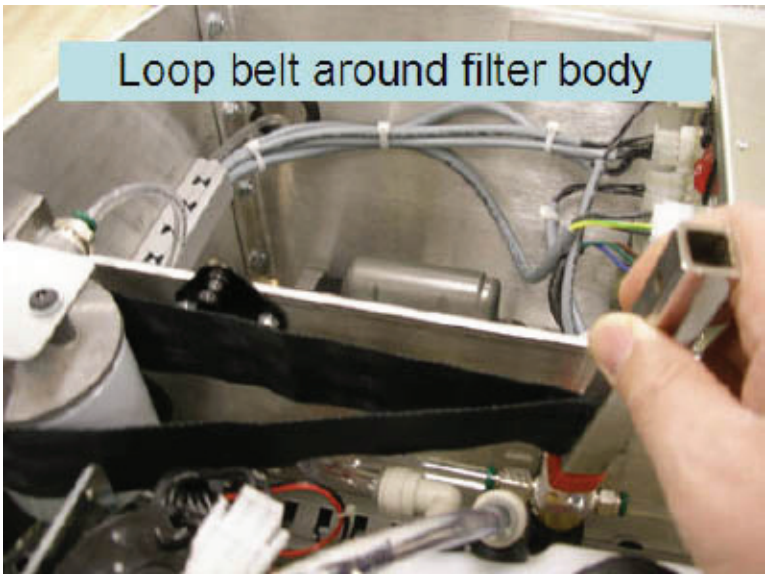


Figure 6-18

Step 3. Installing the New Spin-On Oil Filter

1. Place some oil on your finger and lubricate the rubber seal at the top of the filter. With the filter housing mounted in the machine, install by turning the Spin-On Oil Filter in a clockwise direction. Spin until filter stops against the filter housing.

2. Using a permanent marker, draw a line on the filter and the housing. This will note the position of the filter in relation to the housing, so you have a starting reference point. Refer to Figure 6-19.

Figure 6-19.

3. Tighten the Spin-On Oil Filter one full turn past the original mark. Use the filter wrench if needed. Refer to Figure 6-20. This should seal the filter to the housing at the correct point to prevent the filter from leaking during normal operation of the Envoy.

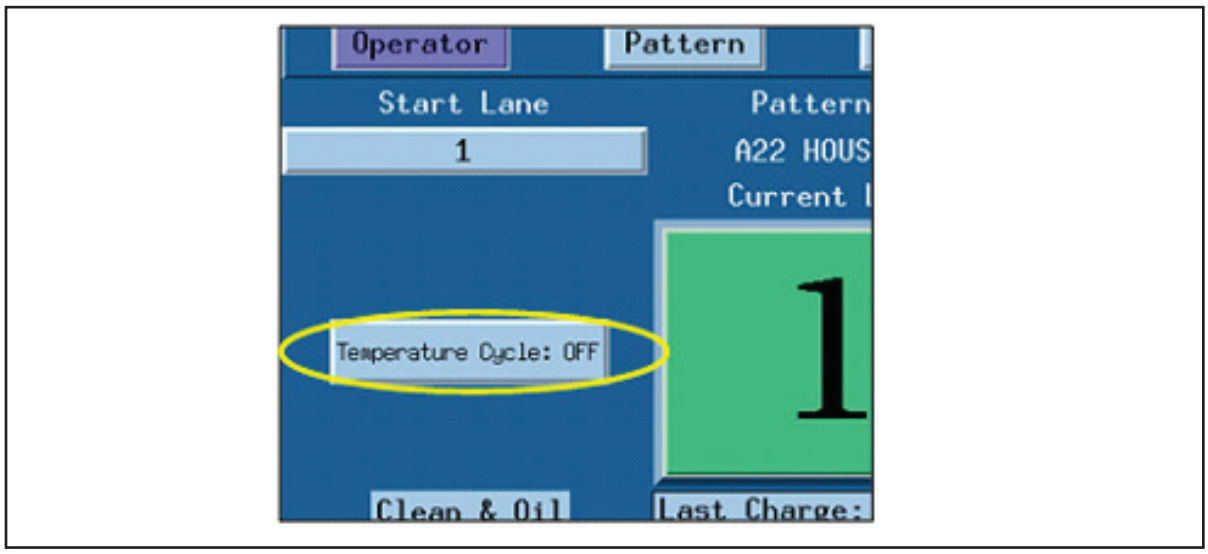
Figure 6-20

Step 4. Bleeding the Conditioner System and Checking for Leaks

1. Fill the conditioner tank with oil.

2. Restore power to the Envoy.

3. From the Operators screen, turn ON the Temperature Cycle Override.



Temperature Cycle Overide

4. Lift the machine to transport position and run the Temperature Cycle until the oil pressure gauge on the accumulator rail reads 30 psi or higher. Turn OFF the Temperature Cycle Override. This will purge the air from the pre pump filter.

5. Lower the machine to the operating position and turn ON the Temperature Cycle Override to run the Temperature Cycle until the oil pressure gauge on the accumulator rail reads 30 psi or higher. Turn OFF the Temperature Cycle Override. This will purge the air from the accumulator rail assembly.

6. Inspect the filter for leaking. If there are leaks present between the filter and the housing, rotate the spin on filter one additional quarter turn clockwise using the Strap Filter Wrench.

Replacing/Cleaning the Conditioner Screen Filters

Refer to Figure 6-17.

Tools needed: Spare container, 3/8” open ended wrench or socket.

Parts needed: Conditioner filter - screen only, 40-mesh, part number 11-655024-004, or complete filter assembly with fittings, part number 14-100321-000.

To replace the conditioner screen:

1. Place machine in operating position with cover open.

2. Disconnect the cables attached to the Conditioner Pump.

3. Slowly disconnect tubing from inlet of filter (once air is introduced into the line, the oil in the tubing will flow into the tank).

NOTE: *Place a container beneath the conditioner bowl and strainer assemble to capture any oil.*

4. Loosen the two bolts at the top of the pump and filter assembly that secure it to the rear frame and lift out the cleaner pump and filter bracket

5. Unscrew bowl on the 40-mesh strainer.

6. Clean only the filter by rinsing with isopropyl alcohol or replace, if necessary. (Screen only part number 11-655024-004).

7. Replace screen and bowl.

8. Replace the pump and filter bracket in the machine, tighten the bolts, reconnect the supply tubing and the pump power cable.

9. Restore power to machine.

10. Go to "Operator Screen" of the GUI. Turn on the temperature cycle to run the conditioner pump. Verify the bowl strainer does not leak.

NOTE: *This forces air out and circulates oil through the system. Repeat this procedure as needed until there is no air in the conditioning system.*

Replacing the Conditioner Pressure Sensor or Temperature Sensor

Refer to Figure 6-17

Tools needed: 1/2" wrench, Adjustable wrench, Spare towels/rags.

Parts needed: Replacement Pressure Sensor, part number 11-696945-000, or Temperature Sensor, part number 11-696944-000.

1. Place machine in operators position and supply power to the machine.

2. Depressurize conditioning system: in the "Conditioner Diagnostics" screen of the "Maintenance" menu, turn on the conditioner vent valve and the pressure control valve until the pressure gauge and digital sensor both read "0".

3. Turn off power to the lane machine.

4. Disconnect electrical cables from both the pressure and temperature sensors (push down and away on tab to disconnect).

WARNING! Verify there is no pressure with the analog gauge on the accumulator rail.

5. Loosen and remove 2 nuts (5/16-18), with a 1/2” open end wrench or socket, that secure accumulator rail assembly to the machine’s center compartment wall.

6. Disconnect 3/8” tubing and 1/4” tubing from each end of the accumulator rail assembly.

NOTE: *Place towels underneath tubing and position tubing upward to prevent dripping.*

7. Carefully remove accumulator rail assembly and place it on a work bench.

NOTE: *Cover the ends of the tubes to prevent inadvertent drips and drain residual conditioner in a container.*

8. Remove the faulty sensor using an adjustable wrench.

NOTE: *Pressure sensor is always on the same side of the rail assembly as the pressure gauge, with the temperature sensor on the other side.*

9. Inspect the sensor mounting hole and remove any debris in threads.

10. Install new sensor with the adjustable wrench, there should be pre-applied pipe sealant on the threads.

11. Replace accumulator rail assembly.

12. Place the accumulator rail assembly in position and insert and tighten nuts that secure the assembly to the machine’s center compartment wall.

13. Reconnect 3/8” and 1/4” tubing.

14. Reconnect cables from both sensors at connector.

15. Turn on “Temperature Cycle” in the “Operator” menu to cycle conditioner through the system.

The Buffing System

Adjusting the Buffer Brush

Tools needed: 3/8” socket wrench and 9” extension, 9/64” Allen wrench, buffer/squeegee adjustment tool.

1. With the machine in the operators position, lower the buffer brush in the diagnostics for conditioning using the “Toggle buffer brush” button.

2. Once the brush is in the down position, disconnect power cord from the machine and lift into the transport position.

3. Lay the handle on the floor with a towel underneath and open the 7-pin side top cover.

4. Loosen the three (3) bolts that mount the brush lifting motor assembly, to the 7-pin side of the machine, using a 3/8” socket wrench. Refer to Figure 6-21.

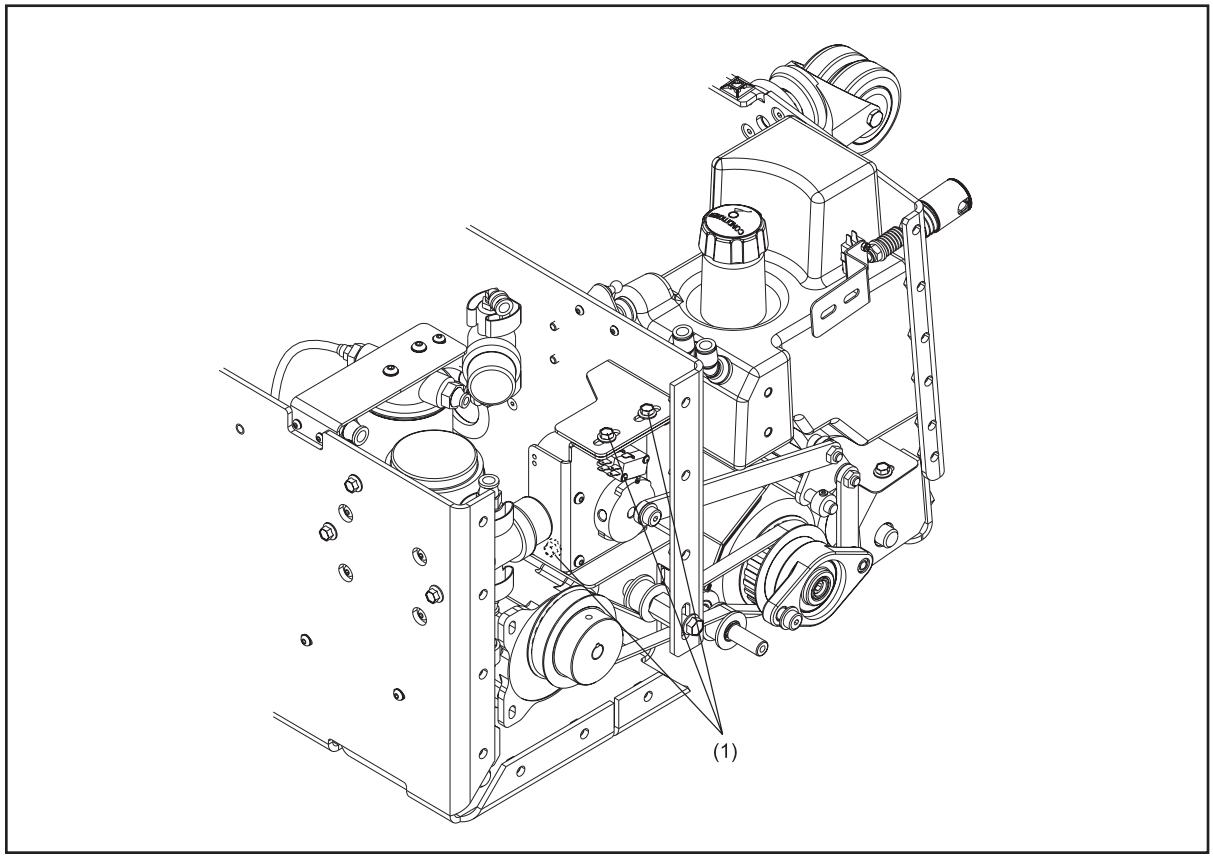


Figure 6-21. Adjusting the Buffer Brush

(1) THREE MOUNTING BOLTS

5. Place adjustment tool (mounted inside the lane machine in front of the electronics enclosure) across the rear wheel and drive wheel on the 7-pin side of the machine. Refer to Figure 6-22.

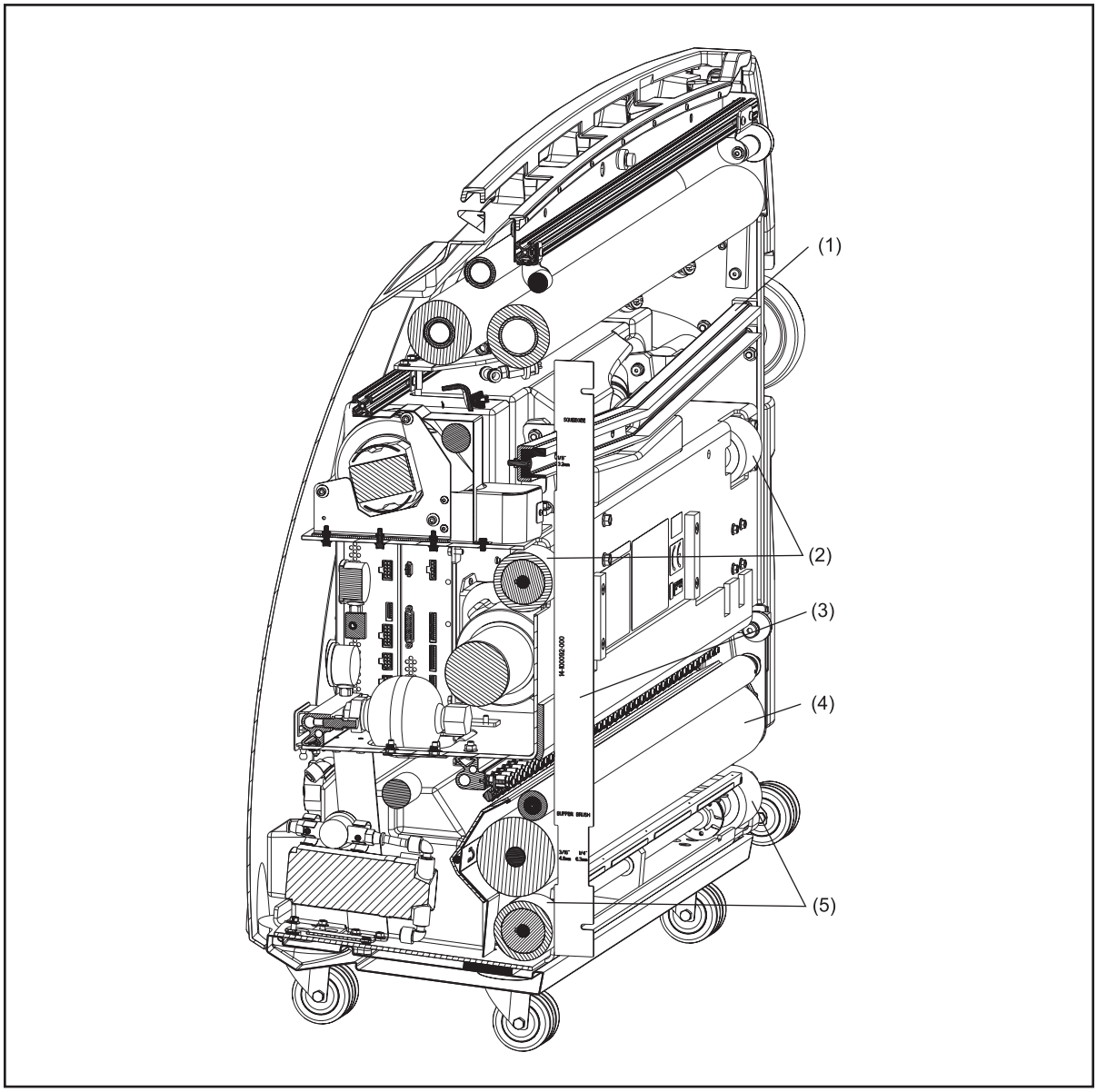


Figure 6-22. Adjustment Tool - Section View

(1) SQUEEGEE/VACUUM HEAD ASSEMBLY
(2) TRACTION DRIVE WHEELS
(3) BUFFER/SQUEEGEE ADJUSTMENT TOOL
(4) BUFFER BRUSH
(5) REAR SHAFT WHEELS

6. Verify that the desired adjustment notch is sitting over the buffer brush (it is suggested to start with the 1/16” notch for the AGM or the 1/8” notch for the Lithium).

7. To raise the buffer brush, move the motor position in the slots toward the front of the machine.

8. To lower the buffer brush, move the motor position in the slots toward the rear of the machine.

9. When the brush is in desired position, snug two of the three mounting bolts using the 3/8” socket wrench.

10. Verify adjustment on 7-pin side of machine, then check the adjustment across the rear and drive wheels on the 10-pin side of the machine.

11. If the adjustment is equal on both sides of the machine, then completely tighten the three mounting bolts making sure not to over tighten and deform the adjustment slots. If the adjustment is not balanced, continue with the following steps.

12. Locate the collar, on the 10-pin side, bottom of the machine (found directly under the dispersion roller) that holds the two sides of the brush lifting shaft. Refer to Figure 6-23.

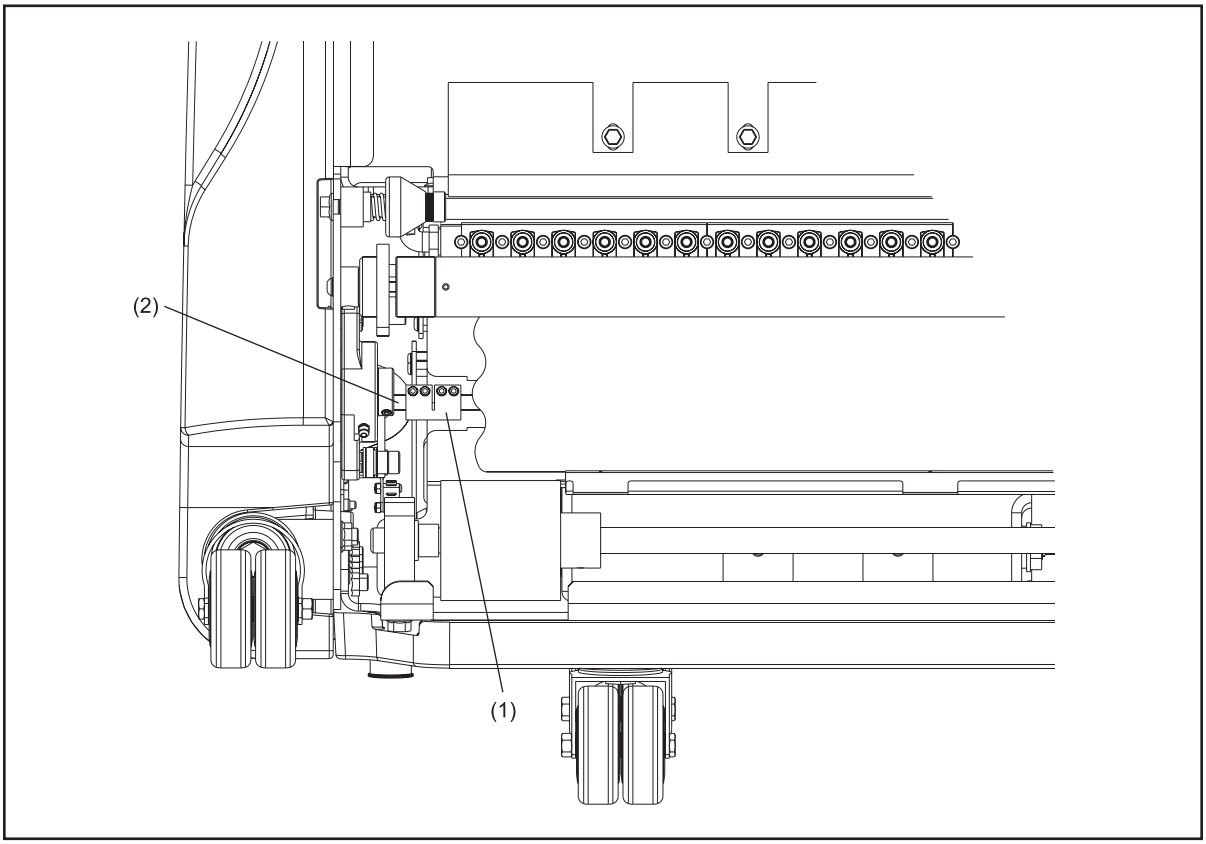


Figure 6-23 Collar

(1) COLLAR (2) SHORT SHAFT

13. Slightly loosen the 2 screws, using a 9/64” allen wrench, on the short side of the shaft assembly.

14. Check the adjustment of the buffer brush and push/pull on the buffer brush wall-mounted bearing until the proper adjustment is achieved.

15. Tighten the screws on the collar.

16. Tighten (but do not over tighten) the four mounting bolts making sure not to deform the adjustment slots. Refer to Figure 6-17.

17. Replace the 7-pin side cover and fasten to the machine.

Replacing the Buffer Brush

Tools needed: 1/8” Allen wrench, and long 1/4” T-Wrench (supplied with kit).

Parts needed: Buffer Brush Assembly, part number 14-100043-000, and attachment screw, part number 11-005308-000, blue loctite.

Refer to Figure 6-24.

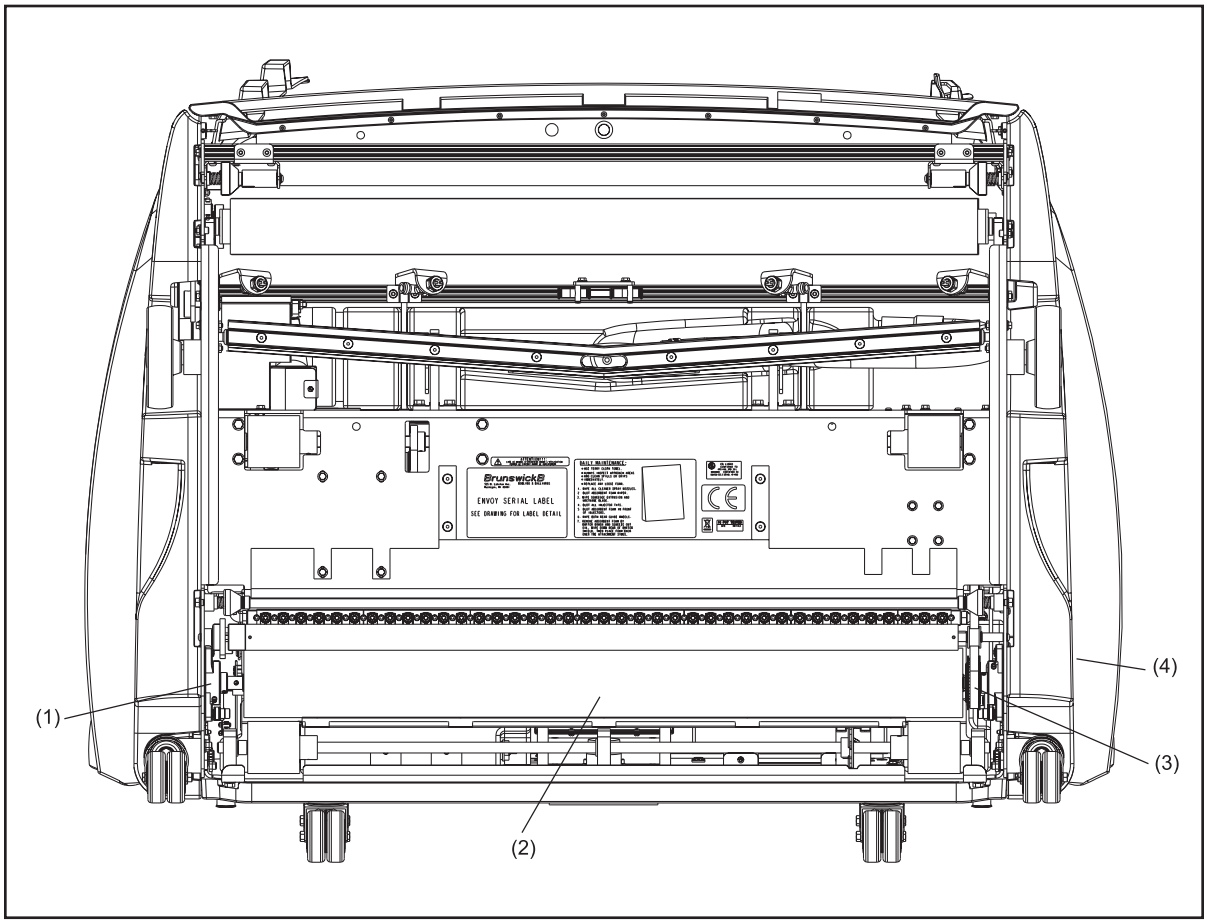


Figure 6-24. Replacing the Buffer Brush

(1) WALL MOUNTED BEARING
(2) BUFFER BRUSH
(3) BUFFER DRIVE PULLEY
(4) ACCESS HOLE FOR 1/4” SOCKET HEAD CAP SCREW

1. Place machine in transport position.

2. Remove 2 set screws on the 10-pin side, wall-mounted buffer brush bearing using a 1/8" Allen wrench.

3. Remove socket-head cap screw inside the buffer drive pulley using 1/4" T-wrench. This will allow the buffer brush shaft to separate from the buffer drive pulley, which will remain in the machine.

NOTE: *Access the socket-head cap screw via the access hole on the 7-pin side of the machine's cover, above the 8" lane wheel.*

4. Slide buffer brush toward 10-pin side of machine, swing brush away from the machine and then slide brush out of the bearing housing.

5. Inspect the groove-end of the buffer shaft and make sure there are no burrs or scars that may effect how well the brush slides into the wall-mounted bearing. File if necessary.

6. Install new buffer brush by reversing step 4.

7. Replace socket-head cap screw using blue loctite.

8. Replace set screws on wall-mounted bearing.

NOTE: *Make sure that the set screws align within the groove on the end of the buffer brush shaft.*

9. Tighten set screws.

10. Verify the adjustment of the buffer brush using the straightedge alignment tool.

11. Place the buffer/squeegee adjustment tool from the drive wheel to the rear wheel, with the edge of straightedge resting on both wheels.

12. Check to ensure that the brush contacts the desired notch of the adjustment tool.

13. Check adjustment on both the 7-pin and the 10-pin sides of the machine.

14. Adjust if necessary.

For information see **Adjusting the Buffer Brush**.

Adjusting the Buffer Belt Tension

Tools needed: adjustable wrench, 1/2” wrench.

Parts needed (if replacing): Buffer Drive Belt, part number 11-655022-000.

Refer to Figure 6-25.

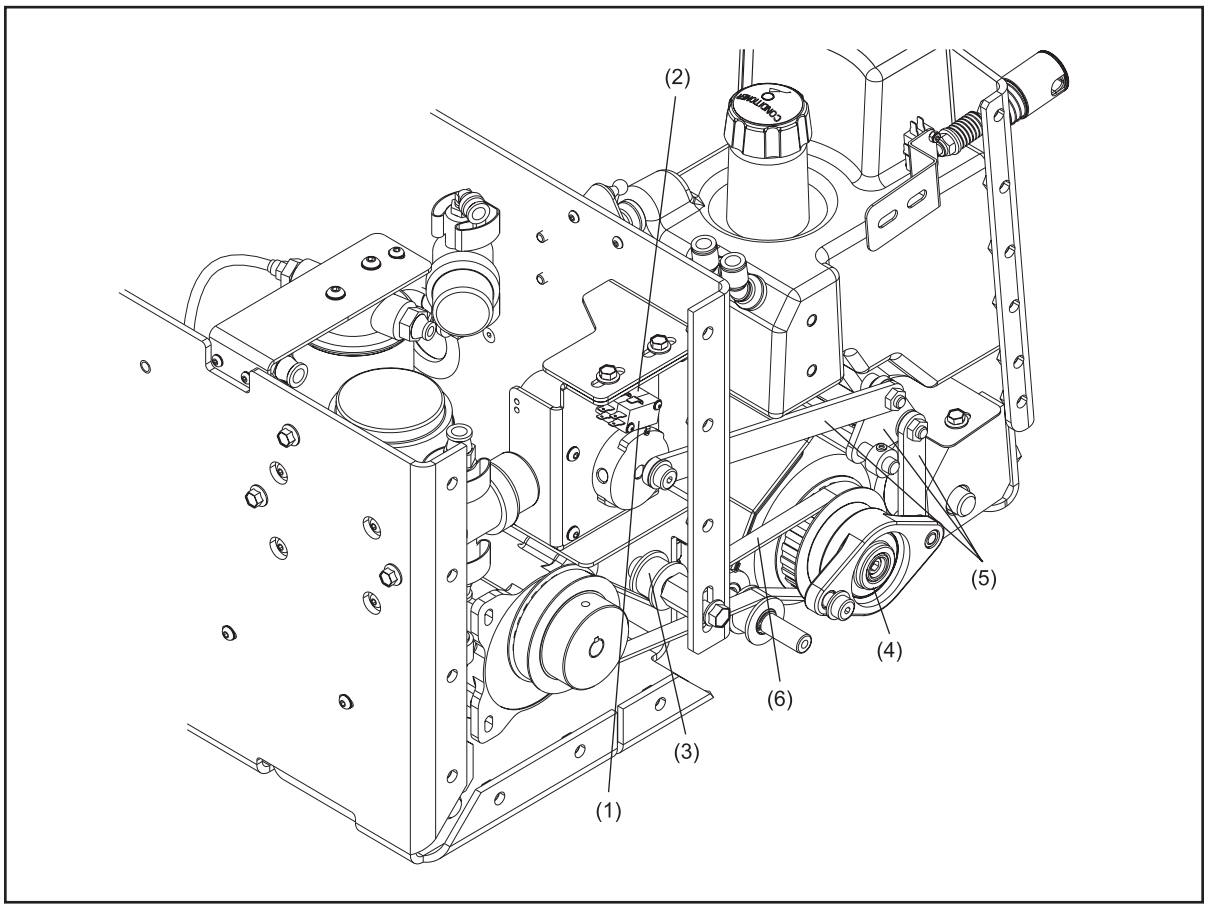


Figure 6-25. Adjusting Buffer Belt Tension, Replacing Buffer Up/Down Switches, Lubrication Buffer Brush Bearings and Lubricating Brush Lifting Assembly

(1) BUFFER UP SWITCH
(2) BUFFER DOWN SWITCH
(3) BUFFER BELT IDLER ASSEMBLY
(4) BUFFER BRUSH BEARING
(5) BUFFER BRUSH LIFTING LINKAGES
(6) BUFFER DRIVE BELT

1. Place machine in transport position with the power supply disconnected.
2. Remove the side cover from the 7-pin side of the machine.
3. Place machine in operating position.
4. Supply power to machine.
5. Lower buffer brush by selecting “toggle buffer up/down” on the “Conditioner diagnostics” screen in the “Maintenance” menu.

6. Disconnect power from machine.

7. Place adjustable wrench on the hex-mount inside the machine and place the 1/2” wrench on the bolt on the outside of the machine.

8. Loosen the bolt from the outside using the 1/2” wrench.

9. To increase belt tension, lower the idler assembly.

10. To decrease belt tension, raise the idler assembly.

11. Secure the assembly position by tightening the nut (place adjustable wrench on spacer nut inside machine, and tighten bolt on the outside of machine using 1/2” wrench).

NOTE: *Make sure that the belt tension is not too tight or too loose. Poor adjustment can cause damage to belt and/or motor.*

Replacing the Buffer Up/Down Switches

Refer to Figure 6-25.

Tools needed: 1/16” Allen wrench, 3/8” open-end wrench, 1/8” Allen wrench, 3/16” Allen wrench, #2 Phillips screwdriver, Straight blade screwdriver, 10mm socket and drive

1. Place the machine in operating position and turn off main power switch on the left hand side cover.

2. Disconnect battery and power identification jumper from the electronic enclosure.

3. Remove the six screws that mount the left hand top cover with a #2 Phillips screwdriver and disconnect the gas spring from the frame using a straight blade screwdriver.

4. Remove the four screws that mount the battery clamps using the 1/8” Allen wrench.

5. Lithium Battery: Remove from the machine.

6. AGM Battery: Disconnect one side of the fusible link and the power cable from the same battery with the 10mm socket and drive, then remove each from the machine.

7. Remove the four screws that attach the frame support between the battery location and the conditioner tank using a 3/8” wrench.

8. Disconnect the level float sensor from the cable harness as well as the two 3/8” tubing and one 1/4” tubing from the conditioner tank.

9. Remove the two screws that mount the conditioner tank and remove the tank.

10. Disconnect the cable harness from the buffer lifting motor assembly.

11. Remove the screw mounting the buffer lift connecting link through the hole in the left hand side frame, with a 3/16” Allen wrench.

12. Remove the three screws that mount the buffer lifting motor assembly from the center frame and remove the assembly.

13. Identify faulty switch.

NOTE: *The up/down switches (which are mounted back to back on the bracket) can be distinguished by the color of their wires; the "up" switch has green and white cables, the "down" switch has blue and black cables.*

14. Disconnect cables from faulty switch at cable connectors.

15. Remove switches from the mounting bracket by loosening and removing 2 mounting screws using a 1/16" Allen wrench.

16. Remove faulty switch.

17. Connect cables to new switch at fast-on cable connectors.

18. Position switches on mounting bracket as close to the motor shaft as possible and tighten screws that secure switches to the bracket.

19. Replace the buffer lifting motor assembly and fasten the three screws with the 3/8" wrench.

20. Connect the buffer lift connecting link to the cam through the access hole in the left hand side frame and tighten with the 3/16" Allen wrench.

21. Connect the cable assembly to the buffer lifting motor assembly.

22. Replace the conditioner tank with the two screws and tighten with the 3/8" wrench.

23. Connect the tubing to the tank and level float sensor to the cable harness.

24. Lithium Battery: Install the battery into the tray with battery cable closest to the electronic enclosure.

25. AGM Battery: Replace both batteries into the tray with the battery cable closest to the electronic enclosure and connect the fusible link and battery cable using the 10mm socket and drive.

26. Replace the battery clamps with the four screws and fasten with the 1/8" Allen wrench.

27. Replace the left hand top cover with the six screws and tighten with the #2 Phillips screwdriver.

28. Connect the gas spring (no tools needed).

29. Connect the battery cable and power type jumper to the electronic enclosure and turn on the main power switch on the left hand side cover.

Lubricating the Buffer Brush Bearings

Refer to Figure 6-25.

1. Attach grease gun to the grease fitting located on the wall mounted buffer bearing.
2. Squeeze gun twice.
3. Repeat for the opposite side.

Lubricating the Buffer Brush Lifting Assembly

Refer to Figure 6-25.

1. Apply one drop of oil to the bearings in the buffer brush lifting linkages on 7 and 10-pin sides.

Replacing the Dispersion Roller

Tools needed: 5/32” Allen wrench.

Refer to Figure 6-26.

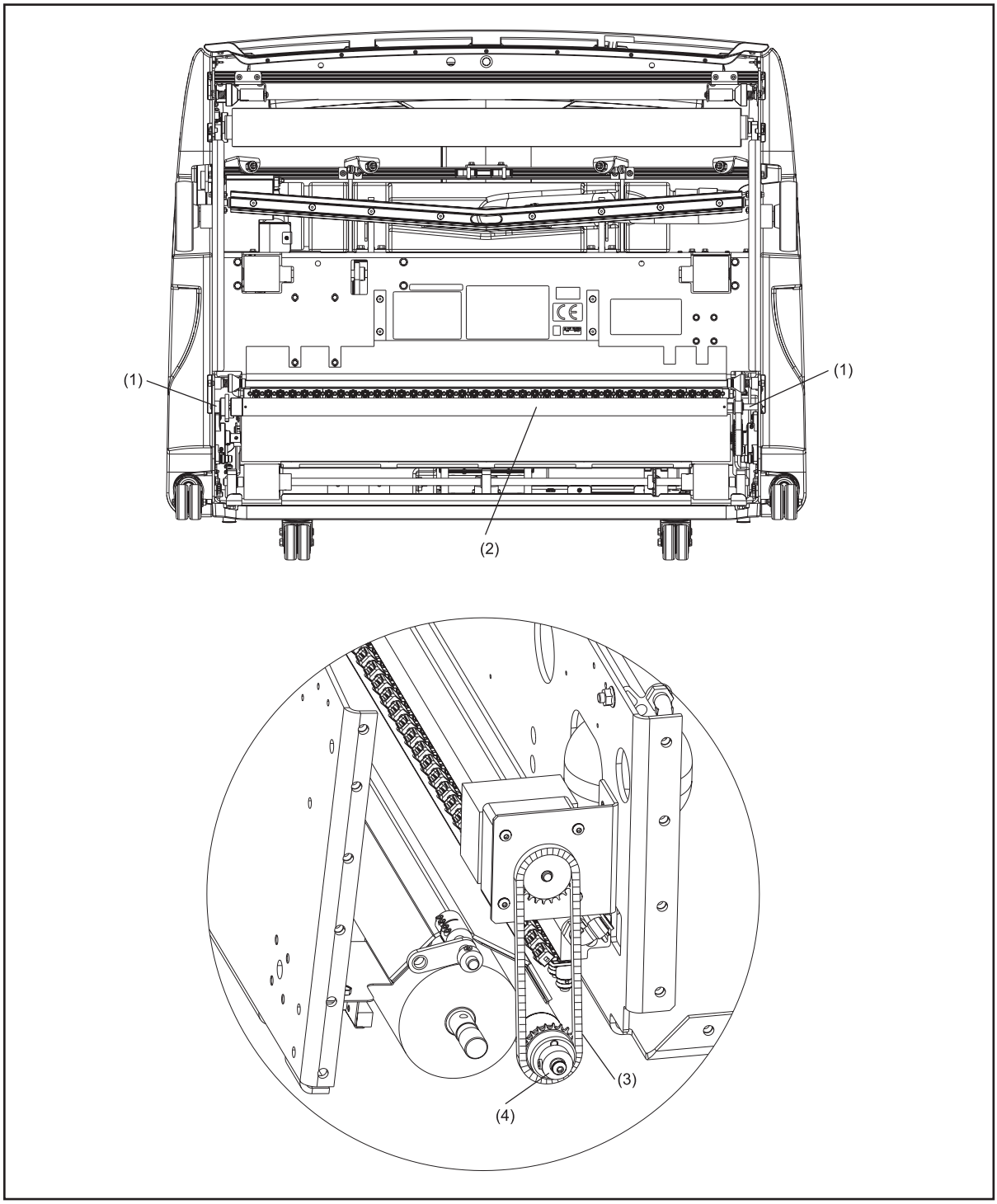


Figure 6-26. Replacing and Lubricating Dispersion Roller

(1) DISPERSION ROLLER MOUNTING BOLTS
(2) DISPERSION ROLLER
(3) DISPERSION ROLLER CHAIN
(4) GREASEABLE END OF DISPERSION ROLLER

1. Place machine in transport position with the power supply disconnected.

2. Remove dispersion roller.

    a. Remove side covers from machine.

    b. Remove 2 button-head bolts—one from each end of dispersion roller using a 5/32” Allen wrench.

    c. Slide the dispersion roller out, removing the roller drive chain from the 10-pin side of the machine.

3. Position the new dispersion roller in place, sprocket end first, replacing the chain on the sprocket.

4. Replace the buffer brush idler pulley on the mounting shaft and ensure that it’s in-line with the motor drive and brush drive pulleys, and make sure the drive belt is in proper position.

5. Insert button head bolts and position the dispersion roller in the center of the mounting slots. Refer to Dispersion Roller Adjustment.

6. Tighten button head bolts completely.

7. With the machine in the operator position, lower the buffer brush in the diagnostics for conditioning using the “Toggle Buffer Brush” button.

8. Once the brush is in the down position, disconnect power cord from the machine and lift into the transport position.

9. Verify that there is slight contact between the buffer brush and dispersion roller across the entire width. Adjust the dispersion roller bolt in the side frame slot if necessary for uniform contact.

Lubricating the Dispersion Roller

Refer to Figure 6-26.

1. Place machine in transport position with power supply disconnected.

2. Remove side cover from 10-pin side of machine.

3. Remove the button head bolt that fastens dispersion roller on the 10-pin side of the machine.

4. Insert grease fitting (part number 14-100202-000, supplied in spare parts package) into the dispersion roller.

5. Attach grease gun with standard bearing grease and pump 2 to 3 times.

6. Remove grease fitting and insert bolt.

7. Check adjustment to buffer brush and tighten.

For more information see **Adjusting the buffer brush**.

Replacing the End-of-Lane Sensor

Refer to Figure 6-27.

Tools needed: adjustable wrench.

Parts needed: replacement EOL sensor (Part Number 14-100235-000).

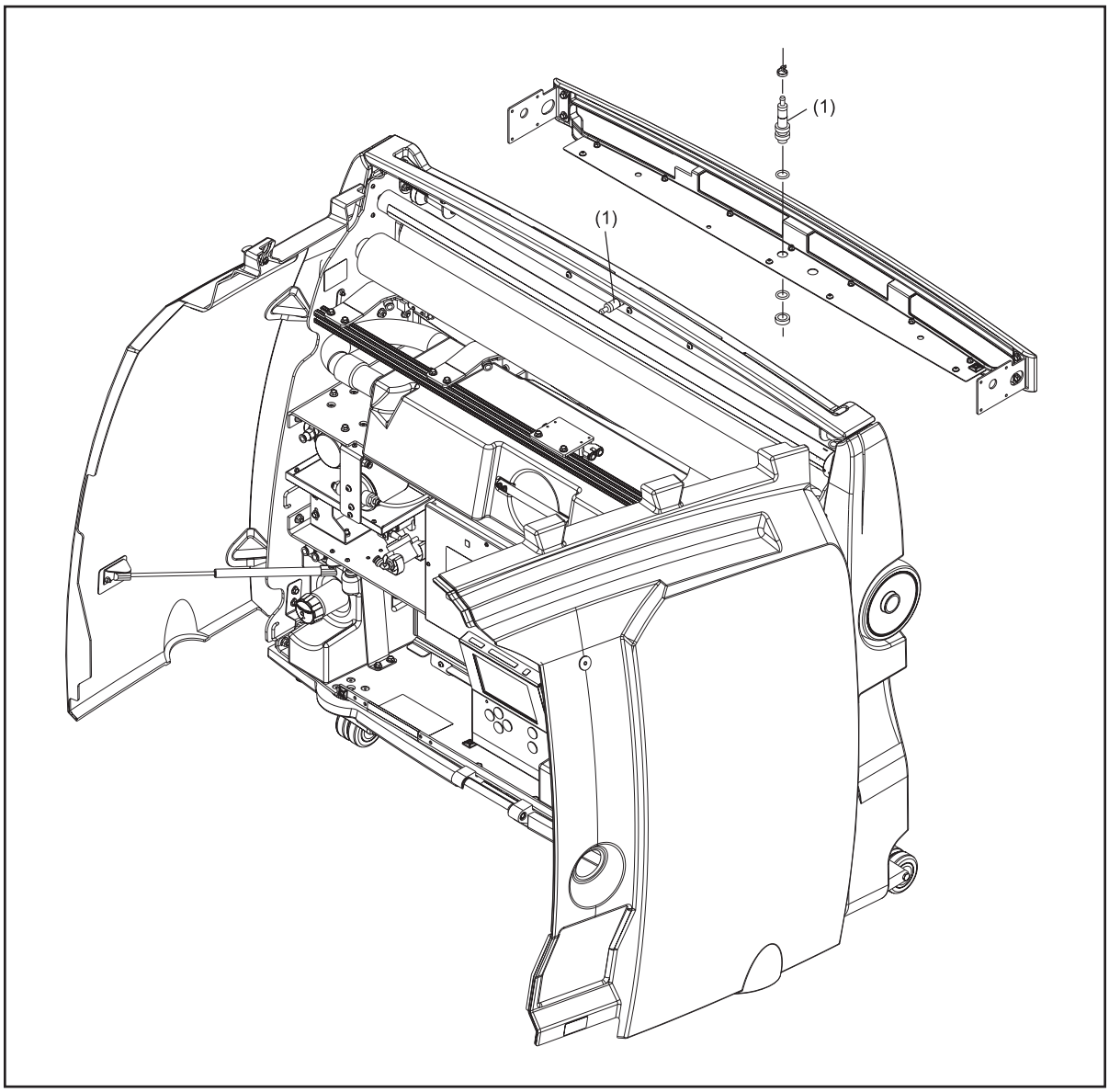


Figure 6-27. End-of-Lane Sensor

(1) END OF LANE SENSOR

1. Place machine in transport position with the cover open and power supply disconnected.
2. Loosen and remove nut at base of sensor.

3. Remove black O-ring from base of sensor.

4. Disconnect sensor cable from the quick-connect cable harness.

5. Pull sensor out from the top side of the machine and remove the second O-ring on top side of the sensor.

6. Place an O-ring under the top-side nut and then install new sensor from top side of the machine.

7. Place the second O-ring on the sensor pushing it up to the bottom side of the mounting shield.

8. Insert and tighten nuts at base of sensor until the end of the sensor is just even with the bottom edge of the lower nut.

NOTE: *Do NOT over tighten nuts.*

Adjusting the Distance Encoder

Tools needed: 11/16” wrench, 3/8” socket wrench, feeler gauges.

Refer to Figure 6-28.

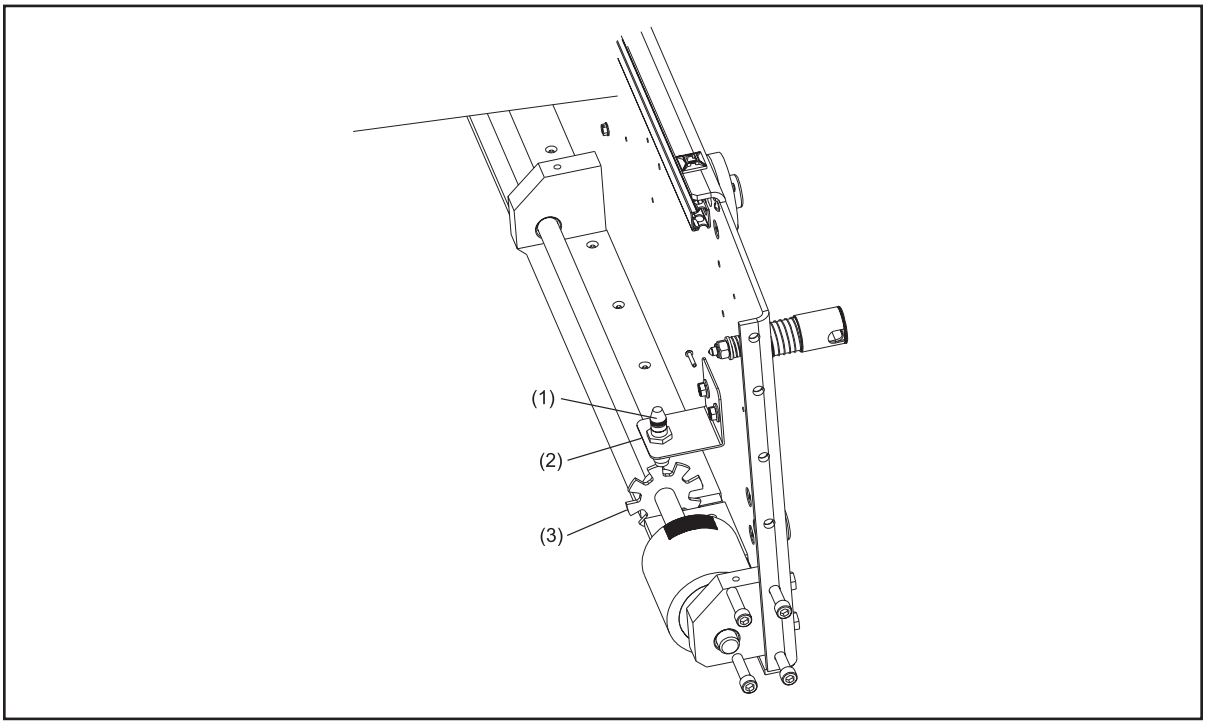


Figure 6-28. Distance Encoder

(1) DISTANCE ENCODER (2) MOUNTING BRACKET (3) ENCODER WHEEL SPROCKET

1. Place machine in transport position with the power supply disconnected.

2. Check the distance between the encoder and the encoder wheel sprocket, using the set of feeler gauges, and verify that it is 1.5mm +/- 0.5mm (.06” +/- .02”). To adjust distance, do the following steps:

a. Loosen mounting nut on bottom side of mounting bracket using 11/16” wrench.

b. Adjust assembly position so that the sensor end of the distance encoder extends 15/16” from the bottom side of the encoder bracket

c. Tighten mounting nut to secure position.

d. Check the distance between the encoder and the encoder wheel sprocket, using the set of feeler gauges, and verify that it is 1.5mm +/- 0.5mm (.06” +/- .02”).

Replacing the Distance Encoder

Refer to Figure 6-28.

Tools needed: 11/16” wrench, 3/8” socket.

Parts needed: replacement distance encoder (Part Number 14-100254-000).

1. Place the machine in transport position with the cover open and power supply disconnected from the machine.

2. Loosen and remove bolts that secure encoder bracket to machine wall (Located underneath the Conditioner supply tank).

3. Disconnect encoder cable from the cable harness.

4. Pull encoder assembly out from the top side of machine.

5. Remove mounting nut on bottom side of mounting bracket using 11/16” wrench.

6. Install new encoder assembly from top side of the machine so that the sensor end extends 15/16” from the bottom side of the encoder bracket.

7. Insert and tighten mounting nut to secure encoder assembly to bracket.

8. Replace bolts to secure encoder bracket to machine wall.

9. Connect encoder cable to the quick-connect cable harness.

10. Check the distance between the encoder and the encoder wheel sprocket. It should be 1.5mm +/- 0.5mm (.06” +/- .02”).

11. Adjust encoder as needed.

Adjusting the Traction Drive Chain Tension and Alignment

Tools needed: 3/8” socket wrench, 5/32” allen wrench.

Refer to Figure 6-29.

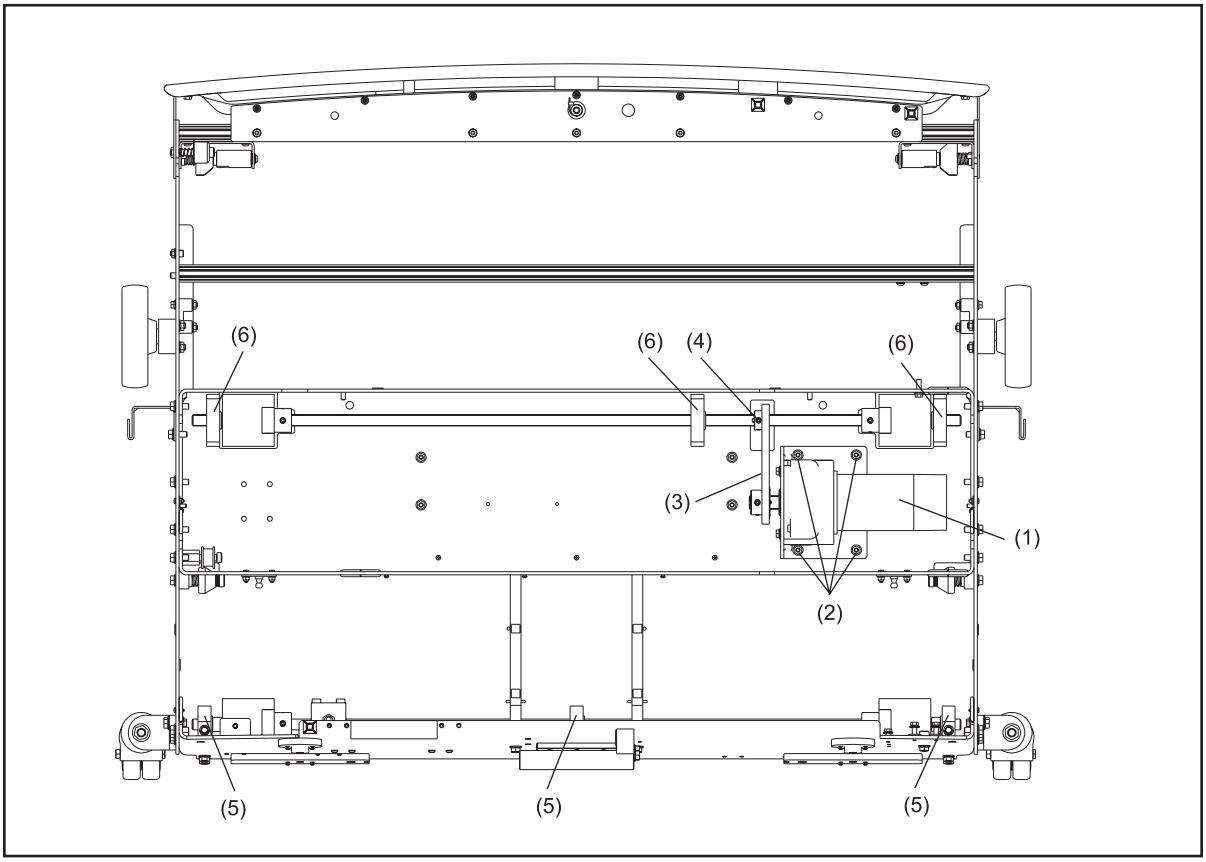


Figure 6-29. Adjusting and Lubricating Drive Chains

(1) TRACTION DRIVE MOTOR
(2) TRACTION DRIVE MOTOR MOUNTING BOLTS
(3) TRACTION DRIVE CHAIN
(4) TRACTION DRIVE SHAFT SPROCKET
(5) REAR SHAFT BEARING BLOCKS
(6) TRACTION DRIVE BEARING BLOCKS

1. When you depress the traction drive chain, there should be about 3/8” of movement in the chain. If there is too much, or too little movement, follow this procedure.

2. Place machine in transport position with power supply disconnected.

3. Slightly loosen 4 mounting bolts that secure the traction drive motor to the frame.

4. Place machine in operating position.

5. Check movement of chain.

6. To tighten chain, slide traction drive motor assembly away from the traction drive wheels to tighten up slack.

7. To loosen chain, slide traction drive motor assembly toward the traction drive wheels to provide more slack.

8. Tighten the 4 bolts on the bottom side of the center compartment to align the chain.

9. Loosen the 2 set screws on the drive shaft sprocket with a 5/32” allen wrench.

10. Carefully, tap the sprocket with a soft-face hammer to align with the motor sprocket.

NOTE: *Improper alignment will cause drive system to make noise during travel.*

11. Tighten the set screws with the 5/32” allen wrench.

Lubricating the Traction Drive Chain and Dispersion Roller Chain

Refer to Figure 6-29.

1. Apply a small amount of chain grease to the traction drive chain at the sprocket and spread the grease across the chain links.

2. Repeat the procedure for the dispersion roller chain.

Lubricating the Bearing Blocks

Refer to Figure 6-29.

1. Apply one drop of oil to each side of the rear-wheel bearing blocks where the shaft and bearing meet.

2. Repeat the procedure for the traction drive bearing blocks.

Replacing Fuses

Tools needed: fuse puller, replacement fuses included in spare parts kit.

1. Place machine in the operator position with the cover open and power supply disconnected.
2. Remove GUI to access enclosure screws.
3. Remove cover from electronics enclosure by removing 6 screws in cover.
4. Locate motor control board (The motor control board is the large board on the top).

NOTE: *See fuse drawings in Appendix.*

5. Locate bad fuse (all fuses are labeled on the control board).

NOTE: *See electrical diagrams in the appendix for more information.*

6. Remove fuse using fuse puller.
7. Install new fuse.

WARNING! Always use the correct size and amperage fuse.

8. Replace cover and reinstall cover screws and GUI.

Replacing the Cord-Kill Switches

Tools needed: 3/8” wrench, 1/16” allen wrench, 1/4” open-end wrench.

Parts needed: replacement switch (Part Number 11-616031-000).

Refer to Figure 6-30.

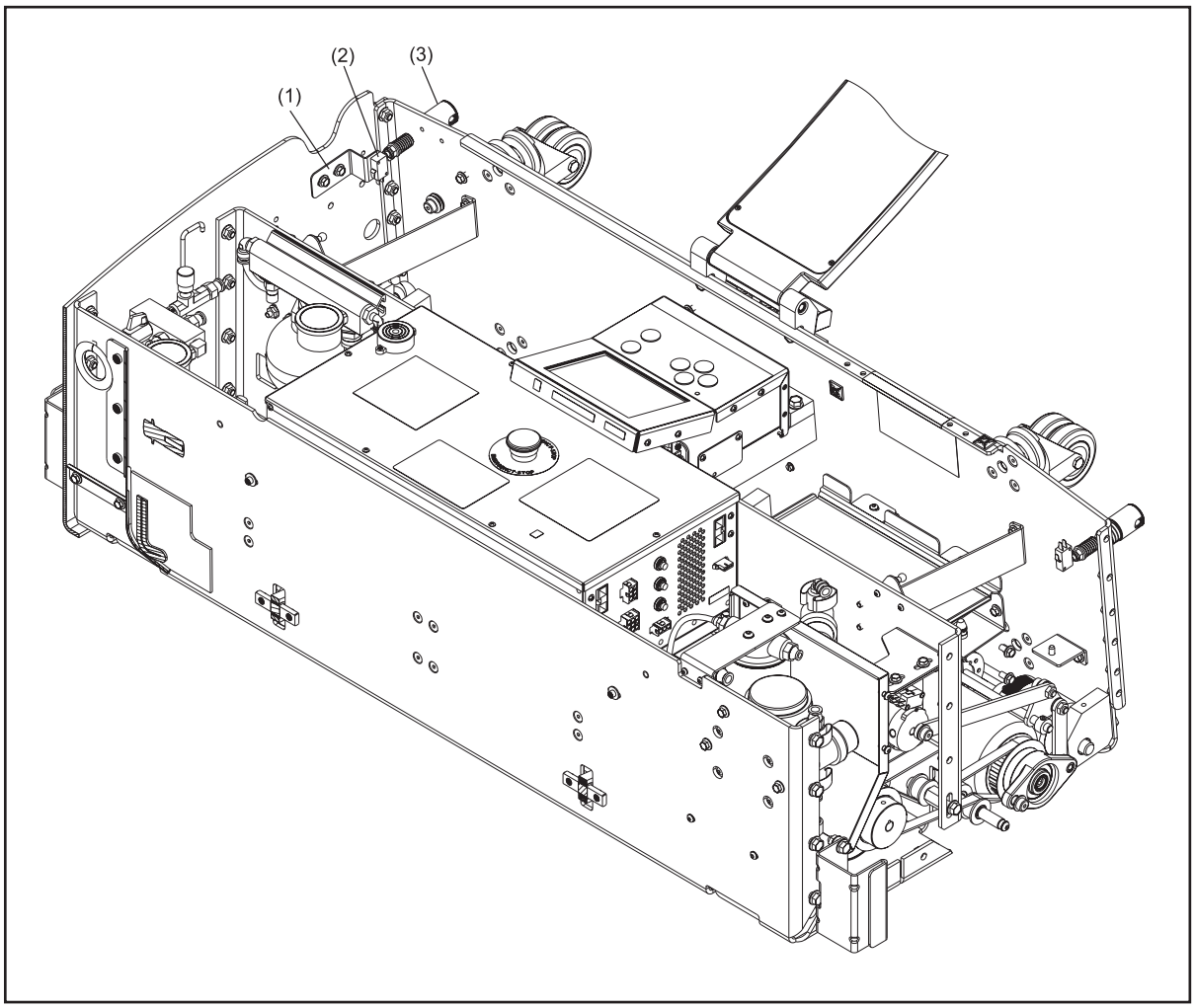


Figure 6-30. Replacing Cord Kill Switches

(1) CORD KILL SWITCH BRACKET (2) CORD KILL SWITCH (3) CORD KILL STUD

1. Place machine in operating position with cover open and power supply disconnected.

2. Identify the bad switch using the Diagnostics screen on the GUI (Refer to Troubleshooting section for instructions on using the GUI Diagnostics).

3. Remove the 2 bolts that secure the cord-kill bracket to the machine side wall and remove the cord-kill switch assembly.

4. Remove the screws that secure the switch to the bracket using a 1/16” Allen wrench & 1/4” open-end wrench.

5. Remove faulty switch.

6. Using the old switch as a guide, reconnect the wires on the new switch following the order for wire connections. Refer to electrical schematics in the Appendix for details.

7. Mount the new switch to the bracket using the 2 mounting screws.

8. Insert and tighten the 2 bolts to secure the bracket to the side wall.

9. Check to ensure there is a 1/32” to 1/16” gap between the cord-kill stud and the switch body to provide the proper contact between the plunger on the lanyard and the switch.

Section 7: Troubleshooting

The Envoy's Graphical User Interface (GUI) will alert you to most operational or maintenance problems by displaying an error or warning message. It is also a powerful tool for troubleshooting. This section teaches you to properly use the GUI to effectively troubleshoot, lists all the messages you might encounter and provides guidance for correcting problems.

This section also provides a highly detailed look at the machine's sequence of operations. Understanding the normal operation can be useful for identifying and correcting problems when they arise.

In this section you will find:

1. A sequence of machine operation, system-by-system.
    a. Preparing for operation
    b. The cleaning system
    c. The conditioning system
    d. The buffing operation
    e. The traction drive system
2. A guide to troubleshooting using the GUI.
3. A list of error messages with troubleshooting guidance.
4. A list of warning messages with troubleshooting guidance.
5. A list of maintenance messages with replacement information.
6. A list of mechanical failures with troubleshooting guidance.

WARNING! Do not attempt to undertake any maintenance or service for which you are not qualified. If you need assistance, or are interested in training, call Brunswick Technical Support, or contact your Brunswick Sales or Service Representative.

If a message appears or a problem occurs that is not addressed in the troubleshooting section, please contact your authorized Distributor or the Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

SEQUENCE OF OPERATION

This section provides a detailed look at how the machine, its controller, and its component parts work together in sequence. Understanding the normal sequence of operations can be a useful resource for troubleshooting.

Preparing for Operation Off Approach

1. When the operator plugs in the charger, the machine warms the conditioner to operating temperature. (This will only occur if the Temperature Cycle feature is turned “ON” on the GUI) The control system:

    a. Opens the conditioner pressure control valve and the conditioner vent valve, allowing the conditioner pump to circulate conditioner through the heated injector rail.

    b. When conditioner reaches operating temperature (factory-set to 80°F (21°C), the conditioner pump turns off and the pressure control valve and the conditioner vent valve close.

    c. The operator screen displays “READY” when the conditioner has reached operating temperature.

Preparing for Operation On Approach

1. When the operator presses “OK” to prepare the machine to operate, the control system:

    a. Rotates the duster cloth take-up roll to lower the duster contact roller into operating position and confirms that the duster cloth is in the “down” position via the duster down switch.

    b. Lowers the squeegee head assembly into operating position via the squeegee up/down motor and confirms that the squeegee is in the “down” position via the squeegee down switch.

    c. Turns on the conditioner pump and conditioner vent valve to slightly over-pressurize the conditioning system (accumulator and injector rail assembly) and then turns off the conditioner pump and vent valve.

    d. Opens the conditioner pressure control valve and conditioner vent valve to allow conditioner to flow back to the conditioner tank until the system has reached target pressure.

    e. Starts the vacuum motor.

    f. The operator screen displays “PUT THE MACHINE ON THE LANE” when the machine is ready to begin operation.

Normal Clean and Condition Operation on Lane

1. As the Envoy is placed on the lane, the system sprays a pulse of cleaner as the duster contact roller assembly is lifted off the “down” switch (only if the start cleaner distance and the start squeegee distance are set at “0” in the Pattern Parameters Screen).

2. Once the machine is properly seated on the lane with the rear wheels aligned with the gutters just in front of the foul line, and the operator presses “OK” for the second time, the control system:

    a. Pulses cleaner on for 5 seconds to wet the lane.

    b. Turns on the traction drive motor to accelerate the machine toward the pin deck.

    c. Directs the cleaner pump to apply a steady spray of cleaning fluid on the lane.

    d. Vacuums the used conditioner and cleaner.

    e. Lowers the buffer brush into contact with the lane surface via the buffer lifting motor at a distance specified by the operator.

    f. Turns on the buffer drive motor to start rotating the buffer brush and turns on the dispersion motor to start rotating the dispersion roller.

    g. Tells the conditioning system to inject conditioner onto the lane surface according to the user’s selected pattern.

3. The machine continues at a steady forward speed and the control system:

    a. Stops the buffer drive and dispersion motors and raises the buffer brush at the end of the user specified conditioner pattern.

    b. Turns off the cleaner spray at the user specified distance.

    c. Pulses the cleaner spray on and off before the pin deck.

    d. Stops the machine at the end of the lane after the end of lane sensor is activated.

    e. Winds the duster cloth to the up position, and advances more cloth for use on the next lane.

    f. Lifts the squeegee into the up position.

4. The traction drive motor is turned on in reverse to accelerate the machine toward the foul line and the control system:

    a. Lowers the buffer brush and turns on the buffer drive and dispersion motors to rotate the brush and dispersion roller once the machine reaches the proper position in the conditioner pattern.

    b. Stops at the foul line, turns off the brush and dispersion motors, and lifts the buffer brush.

c. Turns off the vacuum motor.

d. Turns on the conditioner pump and conditioner vent valve to slightly over-pressurize the conditioning system (accumulator and injector rail assembly) and then turns off.

e. Opens the conditioner pressure control valve and conditioner vent valve to allow conditioner to flow back to the conditioner supply tank until the system has reached target pressure.

The Cleaning System

1. The duster cloth removes dust and dirt from the lane surface. Refer to Figure 7-1.

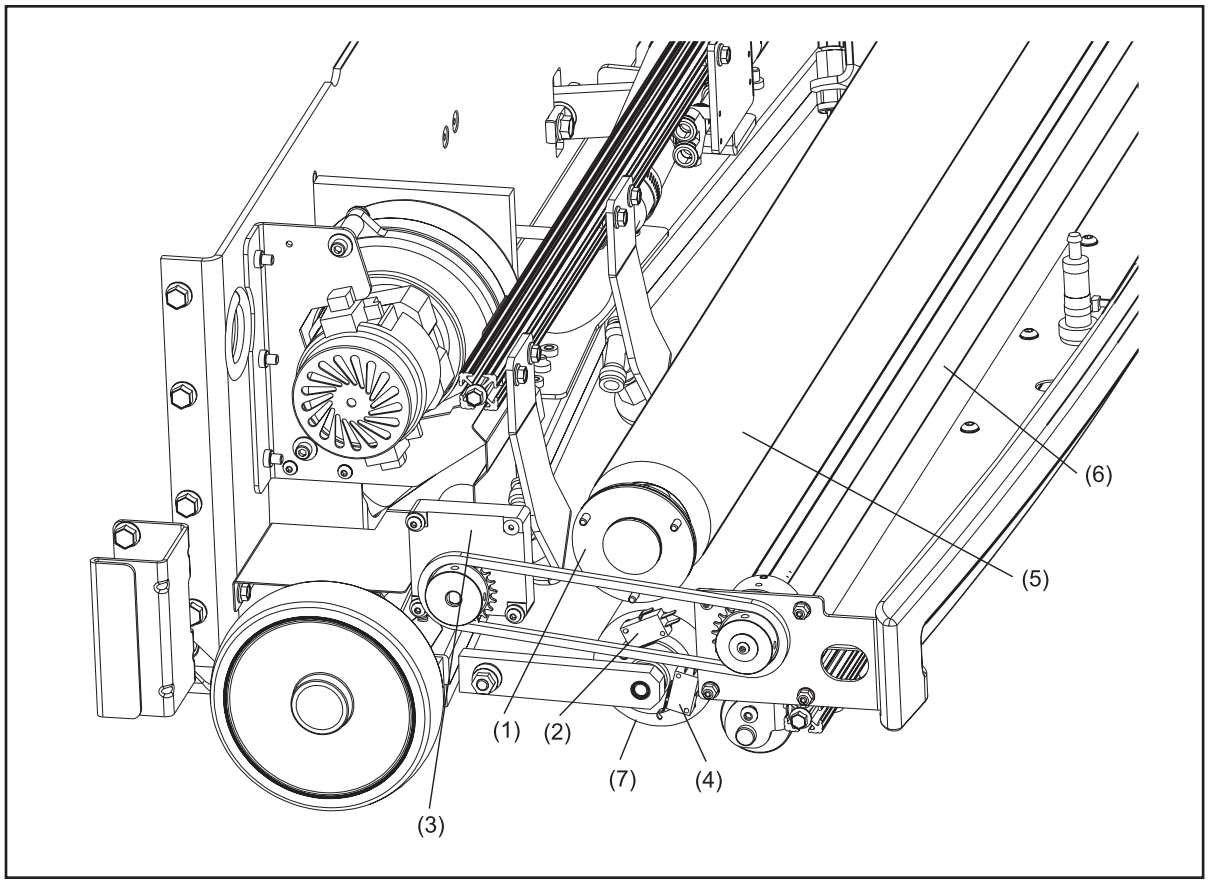


Figure 7-1. Duster Cloth System

(1) DUSTER CLUTCH
(2) DUSTER UP SWITCH
(3) DUSTER CLOTH MOTOR
(4) DUSTER DOWN SWITCH
(5) DUSTER CLOTH SUPPLY ROLL
(6) DUSTER CLOTH TAKE UP ROLL
(7) DUSTER CONTACT ROLLER

a. The duster cloth motor unwinds the duster cloth take-up roll to allow the duster contact roller to lower under its own weight until it engages the duster down switch.

b. The duster cloth dusts the lane surface as the machine travels toward the pin deck.

c. When the machine reaches the end of the lane, the duster cloth take-up roll winds up, creating tension in the cloth that lifts the duster cloth contact roller until it reaches the duster up switch (a friction clutch attached to the duster cloth supply roll is adjusted to ensure the contact roller reaches a fixed stop in the "up" position before it unrolls).

d. The duster cloth take up roll continues to rotate to advance clean duster cloth for use on the next lane.

2. The cleaner pump applies cleaning fluid to the lane. Refer to Figure 7-2.

a. Four spray nozzles apply a continuous spray of cleaning fluid to the lane.

b. A spring-loaded check valve opens when more than 10 psi of cleaning fluid is supplied by the pump.

c. An adjustable cleaner pressure control valve controls the cleaner volume and pressure.

d. The control system turns off the cleaning pump at a distance determined by the user. It also quickly sprays one time on the pin deck before stopping the flow of cleaner through the spray nozzles.

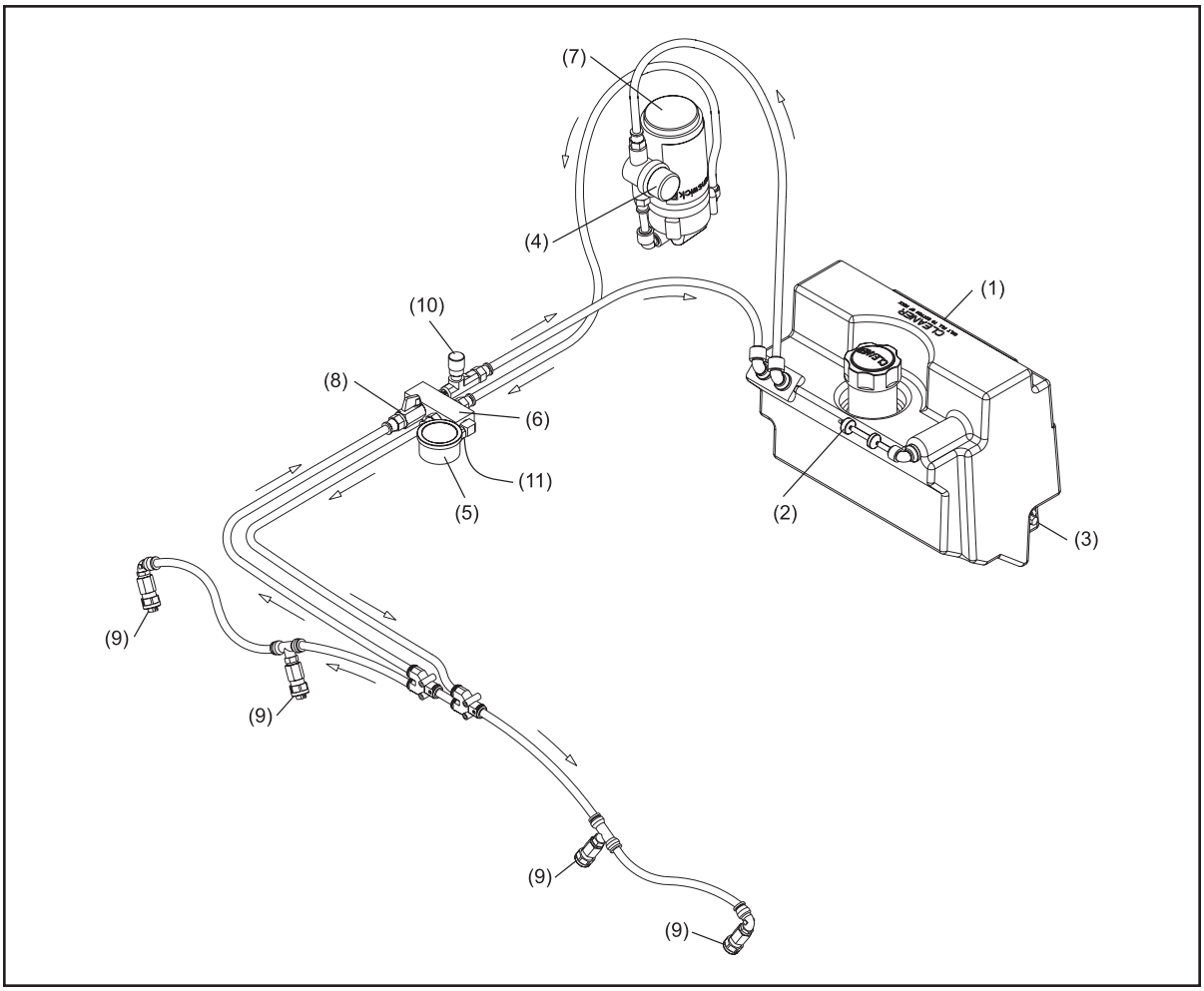


Figure 7-2. Cleaner Spray System

(1) CLEANER SUPPLY TANK
(2) CLEANER VENT VALVE
(3) CLEANER LEVEL FLOAT SENSOR
(4) CLEANER SCREEN FILTER
(5) CLEANER PRESSURE GAUGE
(6) CLEANER MANIFOLD
(7) CLEANER PUMP
(8) CLEANER SHUT OFF VALVE
(9) CLEANER SPRAY NOZZLES
(10) PRESSURE CONTROL VALVE
(11) LOW PRESSURE SWITCH

3. The absorbent wiper agitates the cleaning fluid on the lane to help loosen dirt and conditioner. Refer to Figure 7-3.

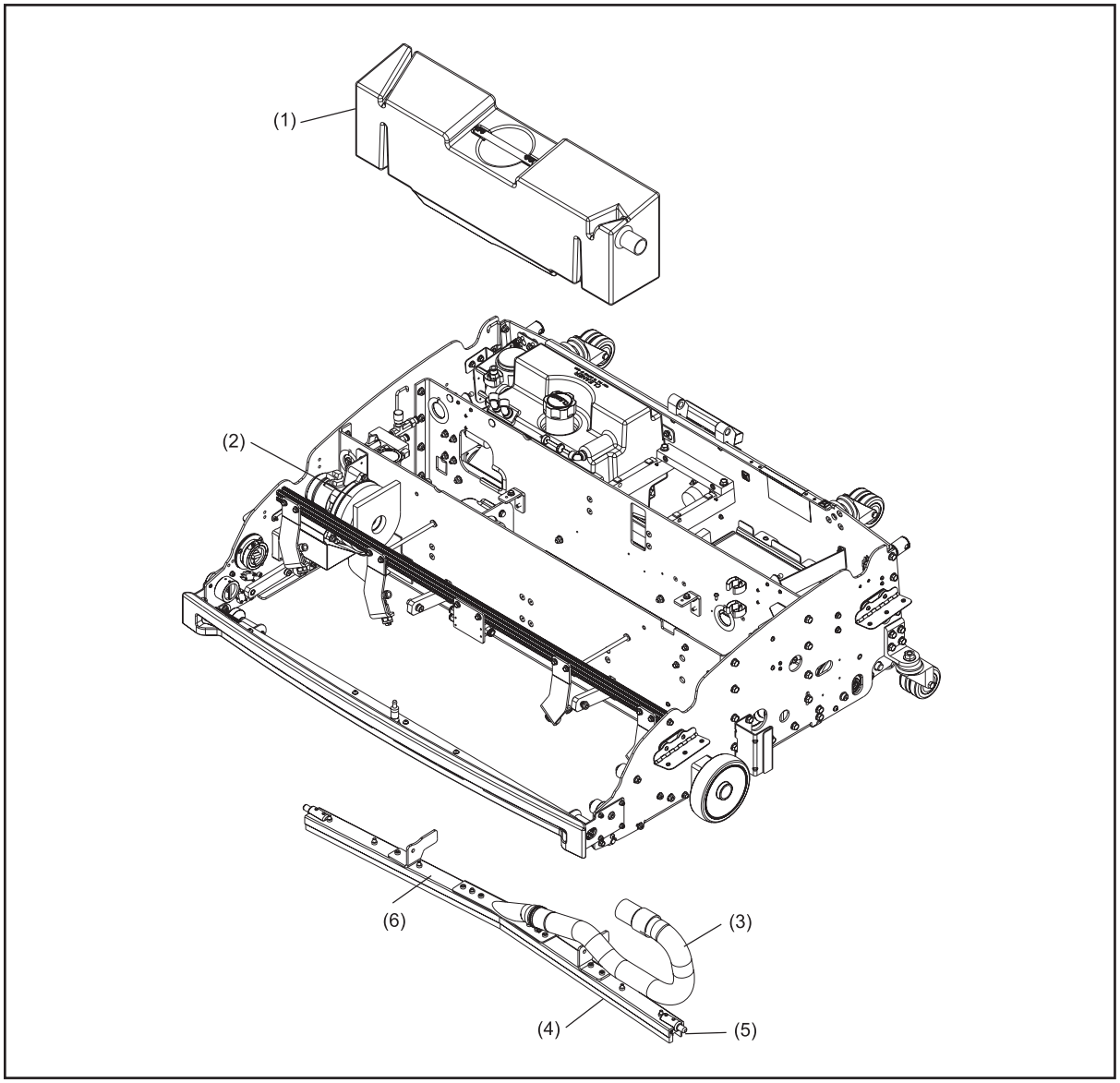


Figure 7-3. Cleaner Vacuum System

(1) WASTE RECOVERY TANK
(2) VACUUM MOTOR ASSEMBLY
(3) WASTE HOSE
(4) ABSORBENT WIPER
(5) SQUEEGEE BLADE
(6) SQUEEGEE HEAD ASSEMBLY

4. The squeegee assembly and vacuum remove cleaner and conditioner from the lane surface and collect it in the waste recovery tank. Refer to Figure 6-3.

   a. The squeegee blade channels waste fluid to the center of the squeegee assembly.

   b. Waste fluid is suctioned to the waste recovery tank.

   c. A baffle system in the waste recovery tank directs waste liquids and solids to the bottom of the tank. This isolates the waste material away from the vacuum motor.

The Conditioning System

1. The machine applies conditioner directly to the lane surface in a pattern specified by the user. Refer to Figure 7-4.

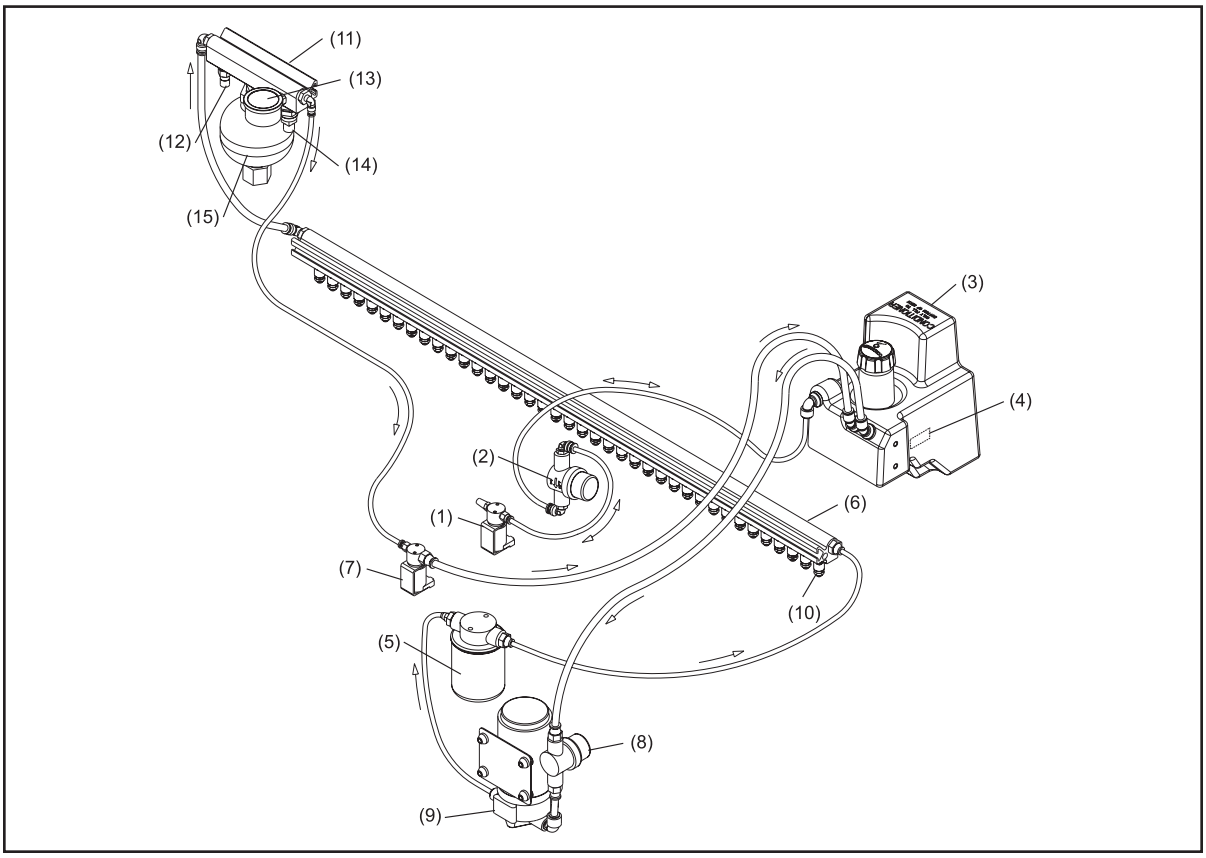


Figure 7-4. Conditioning System

(1) CONDITIONER VENT VALVE
2) CONDITIONER OVERFLOW RESERVOIR
(3) CONDITIONER SUPPLY TANK
(4) CONDITIONER LEVEL FLOAT SENSOR
(5) CONDITIONER SPIN-ON FILTER
(6) INJECTOR RAIL ASSEMBLY
(7) CONDITIONER PRESSURE CONTROL VALVE
(8) CONDITIONER SCREEN FILTER
(9) CONDITIONER PUMP
(10) CONDITIONER INJECTOR
(11) ACCUMULATOR RAIL
(12) CONDITIONER TEMPERATURE SENSOR
(13) CONDITIONER PRESSURE GAUGE
(14) CONDITIONER PRESSURE SENSOR
(15) ACCUMULATOR

a. 39 injectors mounted on a pressurized rail apply conditioner directly onto the lane.

b. The rail is fixed (i.e. the injectors do not reciprocate from side to side) to avoid creating a zigzag conditioner pattern on the bowling lane.

c. Each injector disperses fluid across the approximate width of one board of the lane and is independently controlled based on the conditioning pattern selected.

d. Injectors pulse every 0.1 feet (30.5 mm) (pulse pattern is distance based, not dependent on machine's rate of travel).

e. The pressure of the conditioning system is set before conditioning the first lane as described previously in this section, "Preparing for Operation". The pressure of the conditioning system is then reset as soon as the lane machine returns to the foul line so it is ready for the next lane.

The Buffing Operation

1. During the forward travel of the buffing operation, the machine disperses the conditioner on the lane surface and buffs it, then continues its return travel to the foul line. Refer to Figure 7-5.

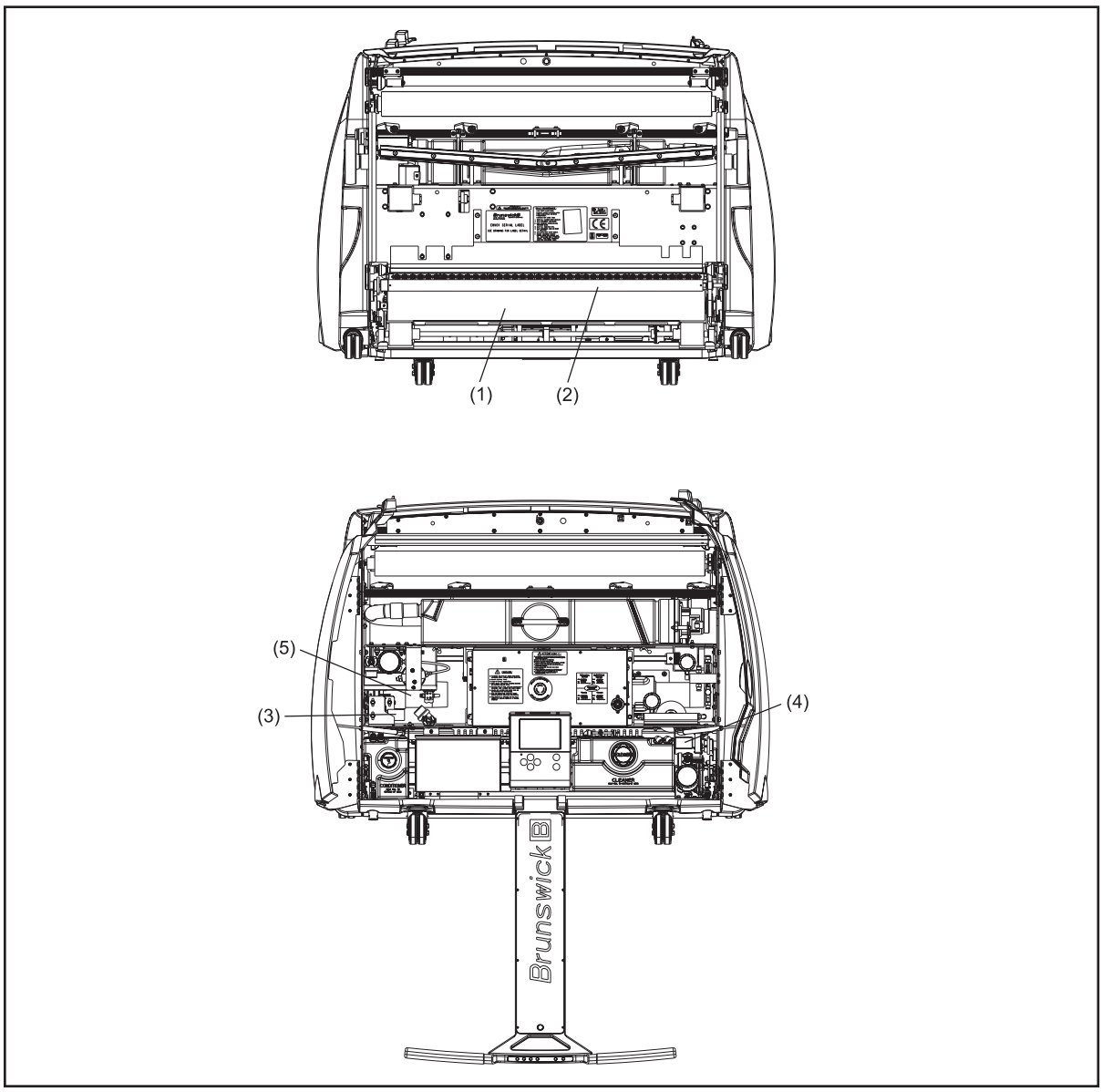


Figure 7-5. Buffing System

(1) BUFFER BRUSH
(2) DISPERSION ROLLER
(3) BUFFER LIFTING MOTOR
(4) DISPERSION ROLLER MOTOR
(5) BUFFER DRIVE MOTOR

a. The buffer brush lowers at the selected starting pattern distance and begins rotating.

b. The dispersion roller, rotating in the same direction as the buffer brush, contacts the buffer brush and blends the conditioner amongst the bristles through side-to-side oscillation.

c. When the machine reaches the end of the selected conditioning pattern distance, the control system stops the rotation of the buffer brush and dispersion roller. It turns on the buffer lift motor and raises the brush up and out of contact from the lane as the machine continues its travel to the pin deck when in the “Clean” and “Oil” mode.

The Traction Drive System

1. The machine travels up and down the lane by means of a traction drive motor connected through a chain to two drive wheels. Refer to Figure 7-6.

    a. At the optional “Quick Clean” speed, the machine travels at a constant 27 inches per second.

    b. At “Max Clean” speed the machine travels at a constant 21 inches per second. This option is used to optimize lane cleaning.

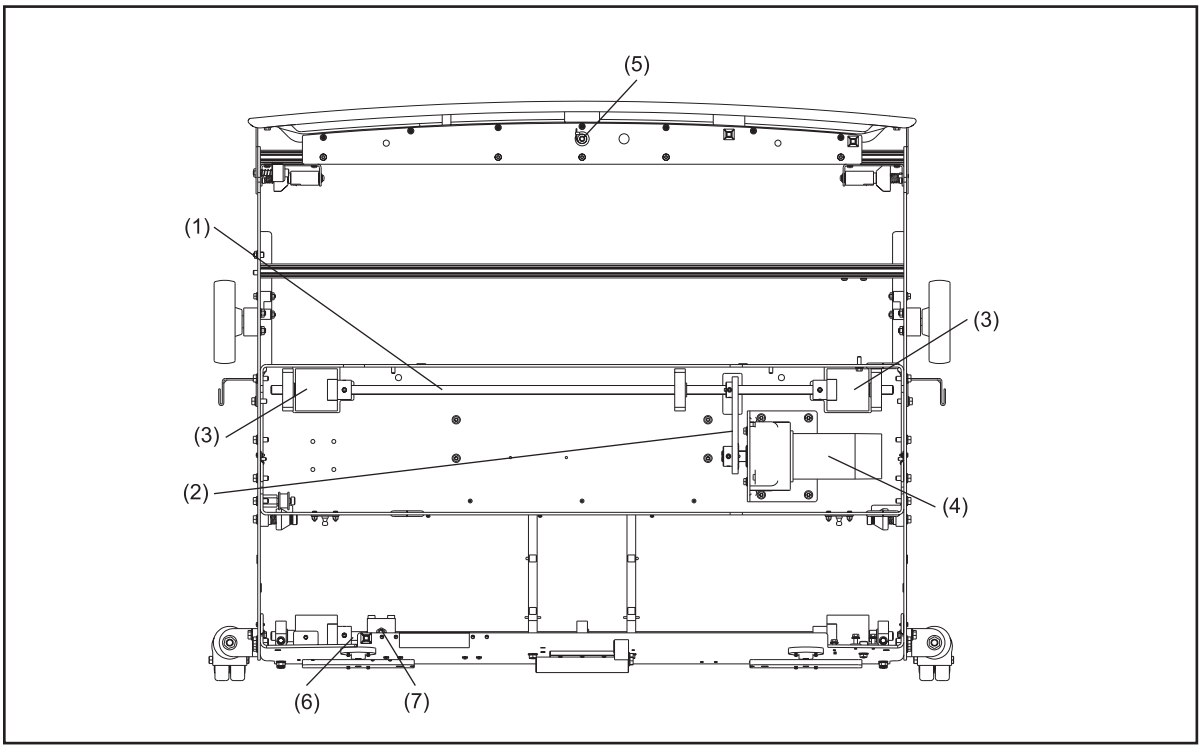


Figure 7-6. Traction Drive System

(1) TRACTION WHEEL DRIVE SHAFT
(2) TRACTION MOTOR CHAIN
(3) TRACTION DRIVE WHEELS
(4) TRACTION DRIVE MOTOR
(5) END OF LANE SENSOR
(6) REAR SHAFT
(7) DISTANCE ENCODER

For information on how to change the travel speed, see Section 4.

2. Forward travel.

    a. The machine travels forward at a constant 21 inches per second (or 27 inches per second at optional quick clean speed).

    b. As the front of the machine travels past the end of the pin deck, the end-of-lane sensor signals the controller to travel an additional 1.2 feet (36.5 cm) before applying the brake.

    c. The squeegee head assembly raises.

d. The duster cloth motor rotates the take-up roll to raise the contact roller away from the lane surface until it contacts the duster up switch.

e. The take-up roll continues to rotate to advance clean cloth for use on the next lane.

f. The traction drive motor turns on to accelerate the machine back to the foul line.

3. Return to the foul line.

a. The machine returns to the foul line in reverse travel at a constant travel speed.

b. The buffer brush lowers into contact with the lane surface at the end of the lane pattern to continue buffing conditioner on the return to the foul line (no conditioner is applied on the return).

NOTE: *If the conditioner values in the last pattern zone equal zero, the buffer brush will not lower until reaching the next to last zone.*

c. As a safety precaution, the machine is designed to decelerate as it reaches the foul line.

d. Once the machine reaches the foul line, the conditioner system prepares the pressure and the GUI displays the number of the next lane to be maintained.

TROUBLESHOOTING USING THE GUI

NOTE: *It is possible for a temporary power loss to cause the electronic enclosure (firmware) to get out of sync with the GUI. If the system appears locked or repeats the same error message, it is recommended that you shut off the power to the electrical enclosure, use a paperclip to force a hard reboot of the GUI, then restore power to the electrical enclosure. This will cause the firmware and GUI to reboot together.*

The GUI is a very helpful tool to use for troubleshooting machine issues that may occur from time to time. In the "Maintenance" menu you can enter the "Diagnostics" sub menu, of the lane machine, and have a choice of selections for "Sensors", "Cleaning", "Conditioning", "Drive", and "Tests". Within each of the choices, you have sensory components and motor functions that can be tested to check the status and functionality.

1. Place the machine in the operator position and supply power.
2. Navigate to the "Maintenance" menu and press "OK".
3. Navigate to the Diagnostics sub menu and press "OK".

The screen will now display your "Diagnostics" options that are broken into each system of the lane machine. Refer to Figure 7-7.

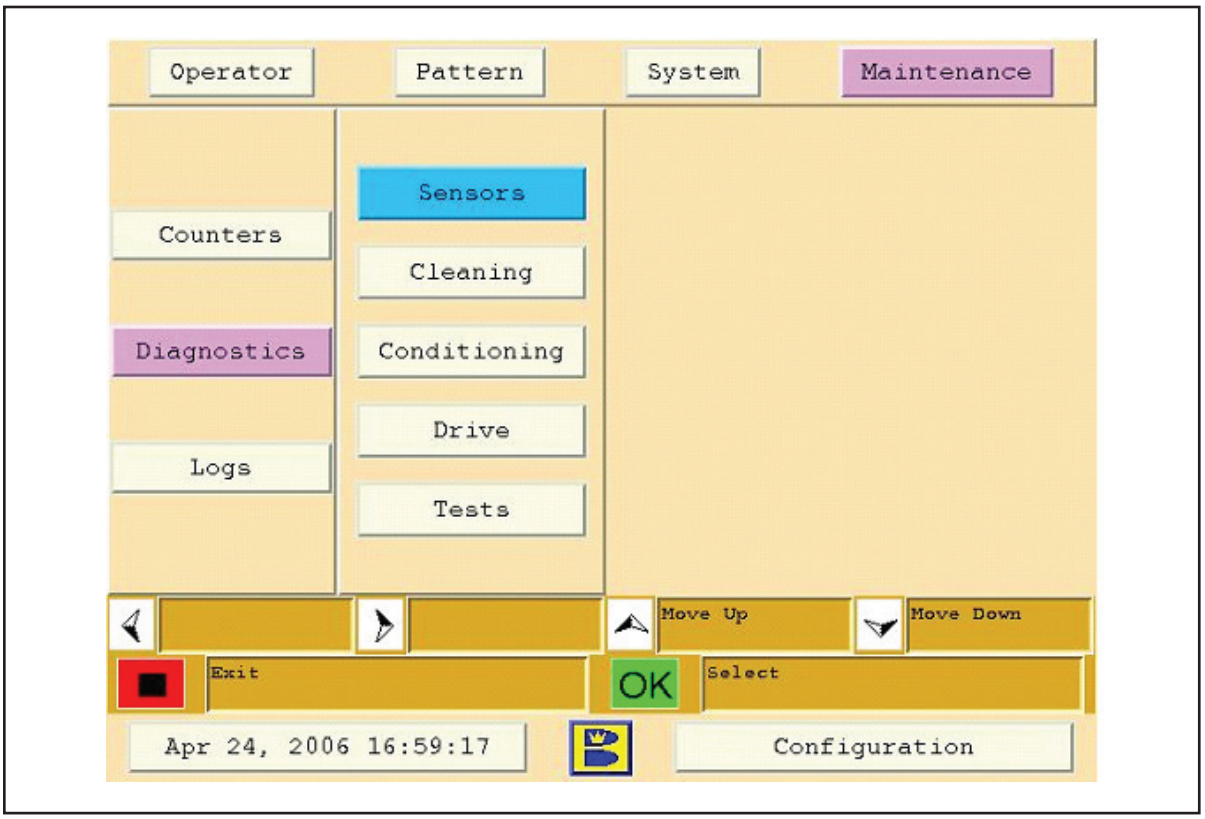


Figure 7-7. Diagnostics

Sensors

The “Sensors” diagnostic screen displays the current status of all sensors and switches used in the lane machine. Refer to Figure 6-8. The display can inform you of the position of a motor or components, such as the “squeegee up”, or can give you a digital reading, such as the temperature or pressure sensors. To test a particular sensor or switch, you can manually activate it by engaging the plunger on the switch or spinning the rear shaft to activate the “speed” encoder. Certain functions can also be tested through the diagnostics for the “Cleaning”, “Conditioning”, and “Drive” systems. Refer to Figure 7-8.

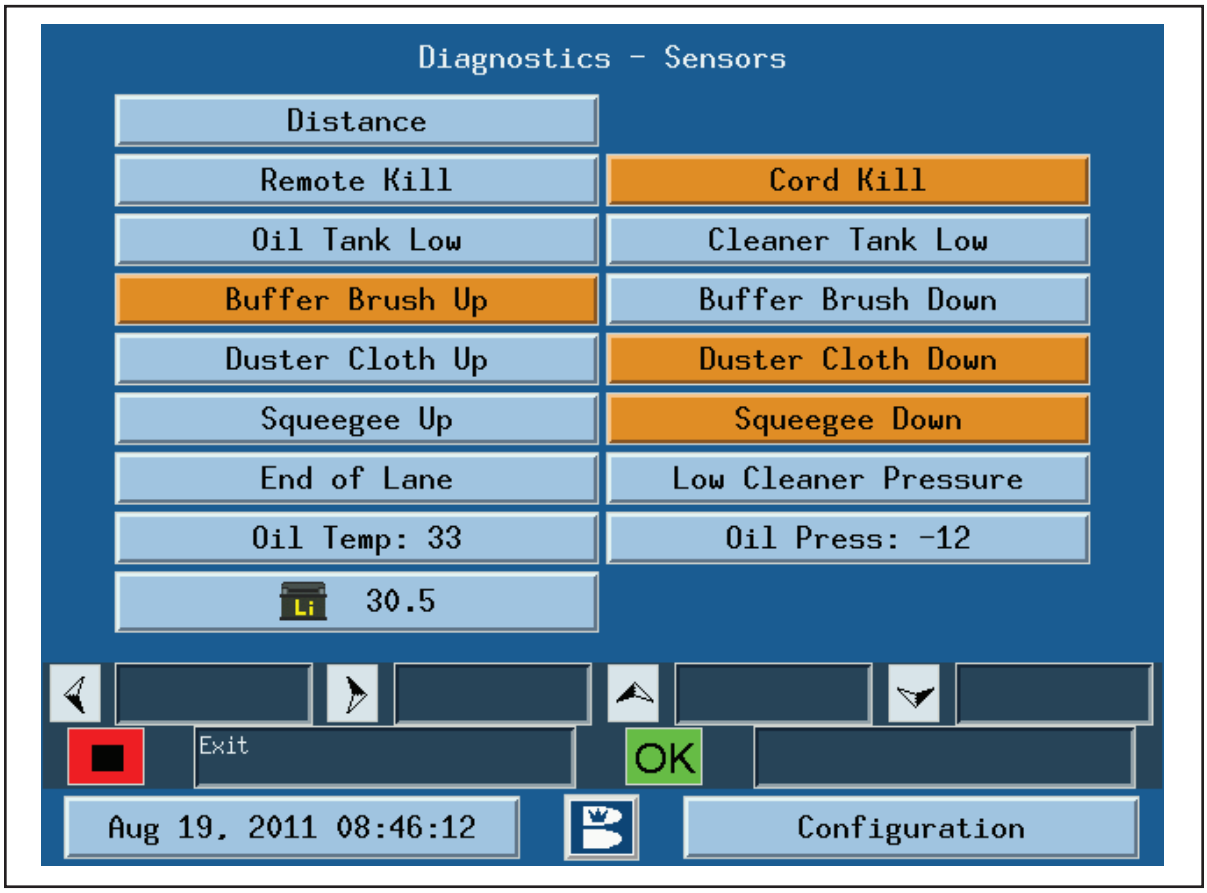


Figure 7-8. Diagnostics - Sensors

1. Use the up and down arrows to highlight “Sensors” and press “OK”.
2. Identify the sensor that is suspect to failure.
3. Physically actuate the switch or sensor and the sensor status will be displayed.

Sensors, such as the fluid level sensors, can only be checked by draining and filling the tank. However, if the Warning message appears and the tank is full, there may be a failure of the sensor.

Cleaning

The “Cleaning” diagnostics screen is split into 2 sections. The top section displays the sensors and current status used in conjunction with the cleaning system (sensors include squeegee and duster position, cleaner fluid level sensor). The bottom section displays the motor functions (vacuum, cleaner pump, duster motor) that can be selected and tested for either a period of up to 20 seconds or may be toggled between positions (Toggle Squeegee). Any timed function can be turned off in less than the remaining 20 seconds by pressing “OK”. Multiple functions may be turned on at the same time (cleaner pump and cleaner valve – to check Min spray pressure). Refer to Figure 7-9.

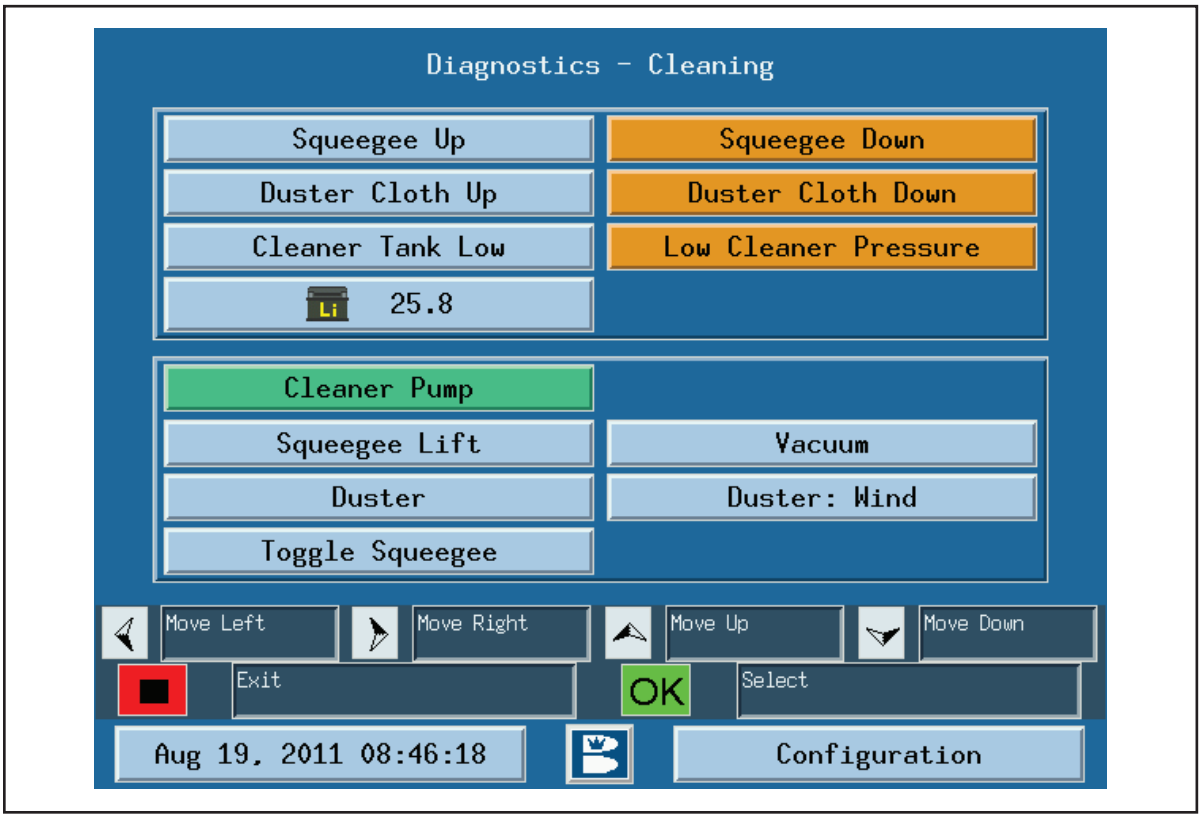


Figure 7-9. Diagnostics - Cleaning

CAUTION! Do not operate cleaner pump with the machine on the approach.

1. Use the up and down arrows to highlight “Cleaning” and press “OK”.
2. Identify and navigate to the motor function that is suspect to failure.
3. Press “OK” and the component will run for 20 seconds and shut off, except for the “Toggle Squeegee” button which moves between the squeegee up and down switches. Any timed function can be turned off in less than the remaining 20 seconds by pressing “OK”.

Sensors will highlight when a motor function related to the sensor is activated.

Conditioning

The “Conditioning” diagnostics screen is also split into 2 sections. The top section displays the sensors and current status used in conjunction with the conditioning system (sensors include buffer position, temperature, pressure, and conditioner supply tank level sensor). The bottom section displays the motor functions (buffer drive and lift motors, conditioner pump, heater, and dispersion motor) that can be selected and tested for either a period of up to 20 seconds or may toggle (Toggle Buffer up/down) between positions. Multiple functions may be turned on at the same time **(always turn on the “Oil Tank Vent” whenever running the “Oil Pump” or the “Oil Press Valve”)**. Refer to Figure 7-10.

Figure 7-10. Diagnostics - Conditioning

1. Use the up and down arrows to highlight “Conditioning” and press “OK”.

2. Identify and navigate to the motor function that is suspect to failure.

3. Press “OK” and the component will run for up to 20 seconds and shut off except for the “Toggle Buffer up/down” button which moves between the buffer brush up and down switches. Any timed function can be turned off in less than the remaining 20 seconds by pressing “OK”.

Sensors will highlight when a motor function related to the sensor is activated.

Drive

The “Drive” diagnostics screen is used to test the traction drive motor. The test can be performed on the lane surface or on the approach. The machine will travel, if on lane, at a slow speed for up to 20 seconds. While it is traveling on the lane, you will notice the distance (speed) encoder sensor button highlighting (on) each time a tooth from the encoder wheel passes the encoder sensor. If you are testing the traction drive motor on the approach, the distance encoder sensor will not transition between on and off unless the rear shaft is rotated by hand. Refer to Figure 7-11.

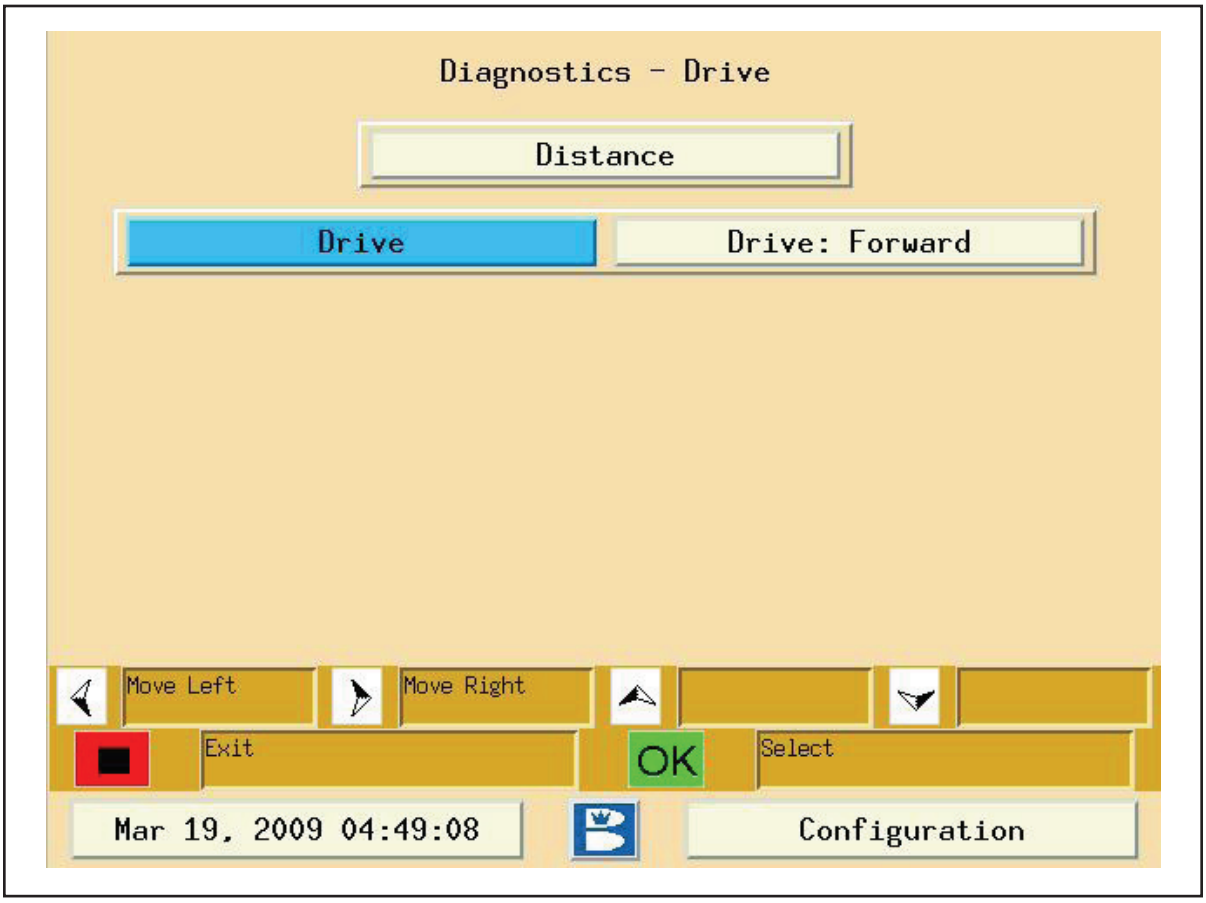


Figure 7-11. Diagnostics - Drive

1. Use the up and down arrows to highlight “Drive” and press “OK”.

2. Navigate, using the left and right arrows, to the “Drive: Forward” and select either forward or reverse by pressing “OK”.

3. Navigate back to “Drive” and press “OK” and the drive motor will run for 20 seconds. Any timed function can be turned off in less than the remaining 20 seconds by pressing “OK”.

Tests

The “Tests” diagnostic screen allows you to test the “Oil injectors” and the “Cleaner spray”. In the event that an oil injector or a cleaner spray nozzle is suspect to failure, you may perform these tests to visually inspect the spray patterns and identify an issue, without the interference of the buffer brush or squeegee assemblies. Refer to Figure 7-12.

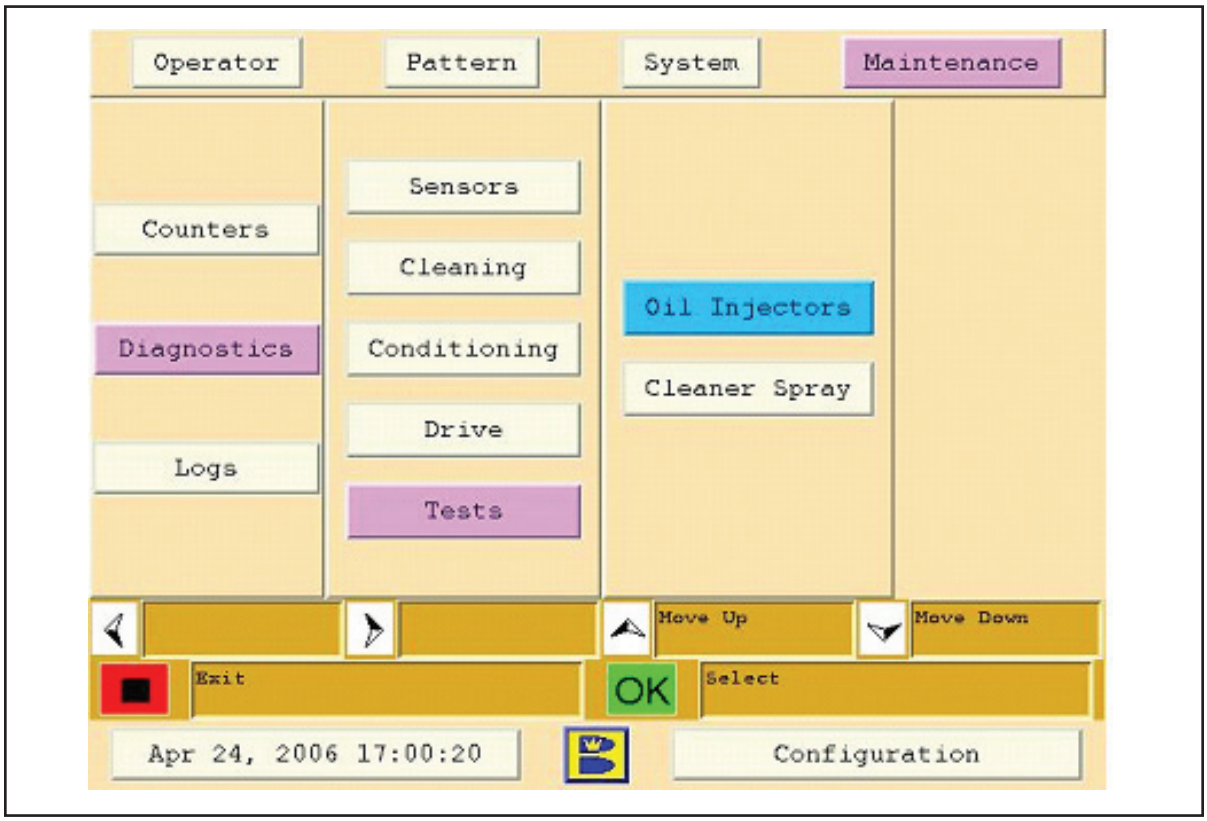


Figure 7-12. Diagnostics - Tests

"Oil Injectors" diagnostics function allows the user to perform specific tests on the injectors to verify that all injectors are firing properly. Refer to Figure 7-13.

The test for the Oil Injectors is designed for the technician to visually see each injectors spray pattern. This diagnostic function verifies that each injector is firing properly and to identify if an injector has failed or not creating the appropriate spray pattern. The machine will travel approximately 25 feet down the lane during this test. The process includes cleaning the lane and firing each injector in a sequential order allowing the technician to easily see each injection without interference by the buffer brush.

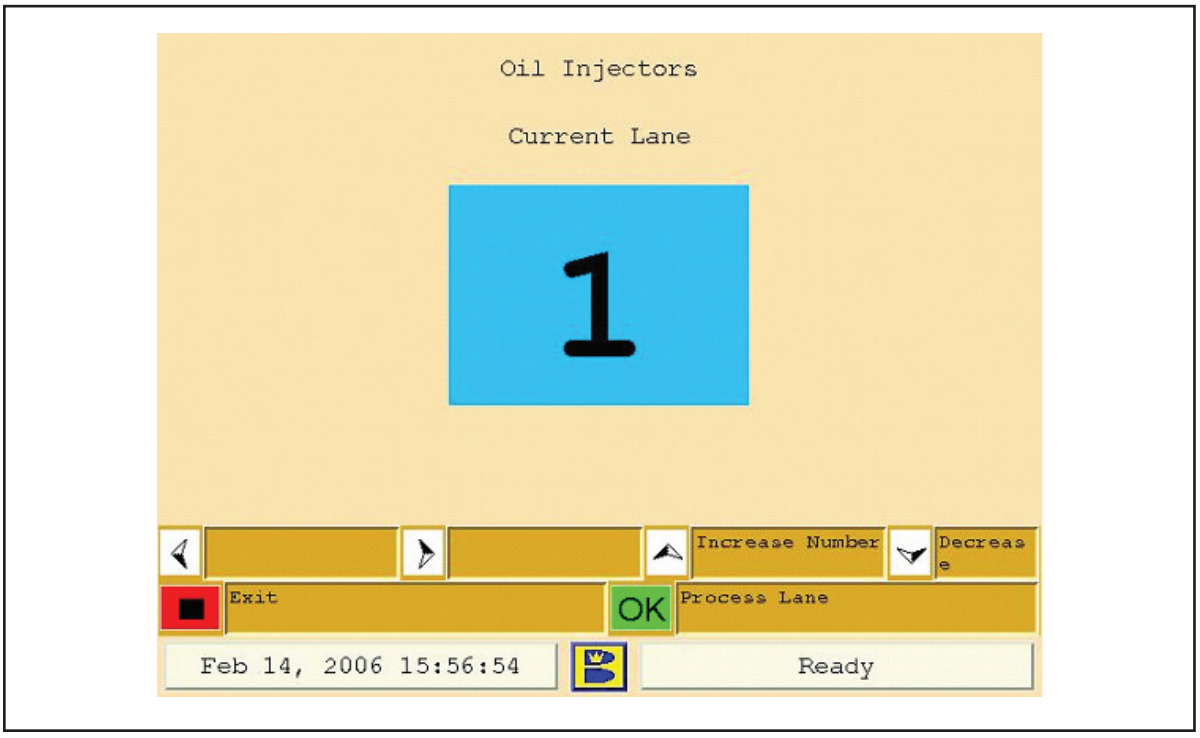


Figure 7-13. Oil Injectors

1. Use the up and down arrows to highlight "Tests" and press "OK".

2. Use the up and down arrows to select "Oil Injectors" and press "OK".

3. Press "OK" to prepare the lane machine to run a lane. The injector test pattern may need to be downloaded.

4. "Put the lane machine on the lane" when instructed.

5. Press "OK" to start the cleaning operation of the "Oil Injectors" test. The machine will automatically clean approximately the first 25 feet of the bowling lane and inject at the same time while performing this test. Perform a clean only or a clean and condition after completion of the Oil Injector test.

NOTE: *After test is completed it will be necessary to clean and recondition the lane with the appropriate conditioner pattern.*

“Cleaner Spray**”** test for the Cleaner spray is used to verify the coverage for both the maximum and minimum spray pressures. This test allows the technician to visually see how well the cleaning spray is covering the lane during a cleaning run. The process is performed in two passes of the lane machine. The first pass of the machine will clean approximately 25 feet of the bowling lane. The second pass sprays cleaner to the bowling lane as it travels without interference of the duster and the squeegee assembly. The cleaner will transition from maximum to minimum about half way through the second run. Refer to Figure 7-14.

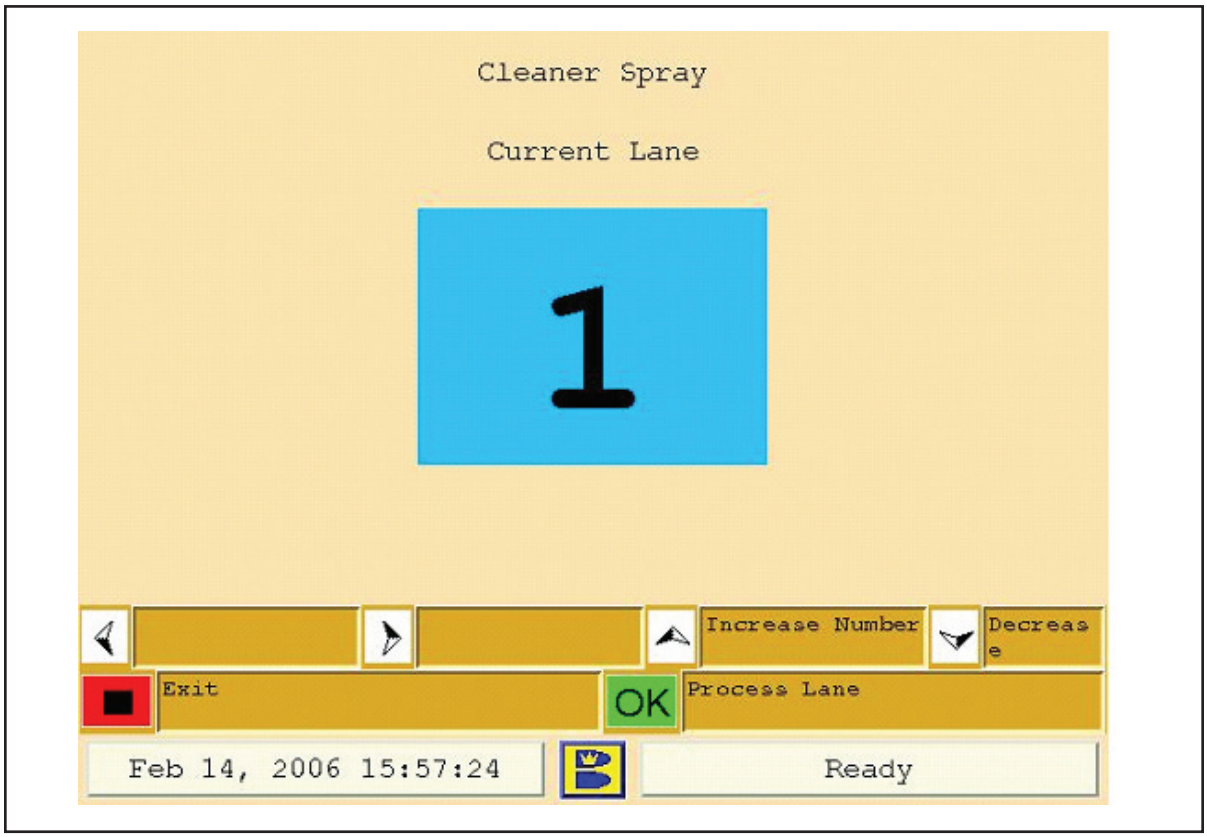


Figure 7-14. Cleaner Spray

1. Use the up and down arrows to highlight “Tests” and press “OK”.
2. Use the up and down arrows to select “Cleaner Spray” and press “OK”.
3. Press “OK” to prepare the lane machine to run a lane.
4. “Put the lane machine on the lane” when instructed.
5. Press “OK” to start the cleaning operation of the “Cleaner Spray” test.
6. Press “OK” when the machine returns to the foul line, this will start the cleaner spray coverage test.

NOTE: *DO NOT allow cleaner to completely dry on lane surface. After test is completed it will be necessary to clean and recondition the lane with the appropriate conditioner pattern.*

ERROR MESSAGES

Error messages appear on the GUI if the lane machine fails during preparation or operation. Some errors allow you to continue operation. Some require immediate attention, especially those that affect the consistency and performance of a conditioner pattern. In such cases, you may need to recondition a lane after correcting the error.

The images in Figure 7-15 are examples of possible error messages the GUI may display during preparation.

ERROR
The Lane Machine is not ready for operation.
The Squeegee is not working properly. The Squeegee Down Sensor did not activate.
OK
ERROR
The Lane Machine is not ready for operation.
The Oil Pressure is not set properly. Oil Pressure is too low.
OK

Figure 7-15. Error Messages - Preparation

The images in Figure 6-16 are examples of possible error messages the GUI may display during operation.

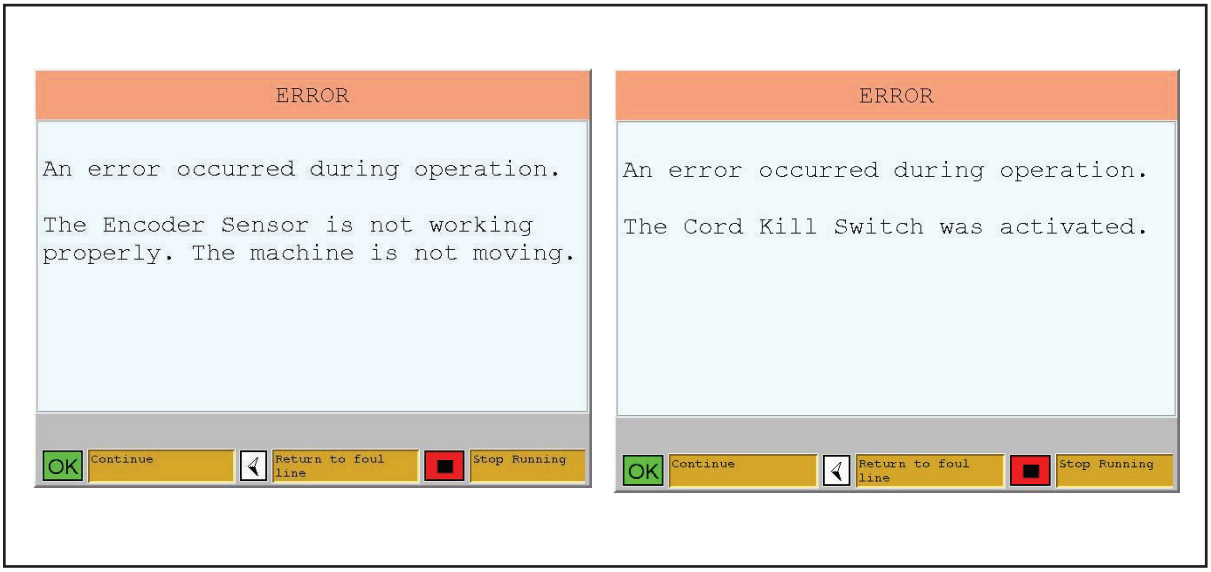


Figure 7-16. Error Messages - Operation

Tables 7-1 through 7-13 provide a list of error messages with potential problems and remedies. If using the Envoy's Diagnostics menu does not resolve your problem, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

List of Error Messages

Error Messages that Appear During Preparation (on approach)

Error Message - Table 7-1:
The lane machine is not ready for operation.
The duster cloth is not working properly. The Duster Cloth down sensor did not activate.

Error Message - Table 7-2:
The lane machine is not ready for operation.
The squeegee is not working properly. The squeegee down sensor did not activate.

Error Message - Table 7-3:
The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too low.

Error Message - Table 7-4:
The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too high.

Error Message - Table 7-5:
A communication error occurred.

Error Messages that Appear During Operation (on lane)

Error Message - Table 7-6:
An error occurred during operation.
The Encoder Sensor is not working properly. The machine is not moving.

Error Message - Table 7-7:
An error occurred during operation.
The Cord Kill Switch is not working properly. The Cord Kill Switch was activated.

Error Message - Table 7-8:
An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush down sensor was not activated.

Error Message - Table 7-9:
An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush up sensor did not activate.

Error Message - Table 7-10:
An error occurred during operation.
The Squeegee is not working properly. The Squeegee Up sensor did not activate.

Error Messages - Table 6-11:
An error occurred during operation.
The Duster cloth is not working properly. The Duster cloth up sensor did not activate.

Error Message - Table 7-12:
An error occurred during operation.
The End of Lane Sensor is not working properly.

Error Message - Table 7-13:
Other error messages.

Error Messages that Appear During Preparation (on approach)

Error Message - Table 7-1:

The lane machine is not ready for operation.
The duster cloth is not working properly. The Duster Cloth down sensor did not activate.

NOTE: *Verify error source through GUI diagnostics.*

What you may observe	Potential problem	Action
1. Duster cloth is down and contacting the switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using GUI diagnostics and replace if necessary
2. Duster cloth is down and not contacting the switch	1. Switch has come out of adjustment 2. Duster contact roller is binding	1. Re-adjust switch so it actuates when cloth is in its full down position 2. Check duster assembly for damage; check for loose hardware
3. Duster Cloth is up and did not lower	1. The duster cloth is routed incorrectly on the take-up core 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Duster motor failure	1. Refer to adjustments in section 4.0 or the diagram located in the Machine 2. Repair connection 3. Verify motor function using GUI diagnostics and replace if necessary

Error Message - Table 7-2:

The lane machine is not ready for operation.
The squeegee is not working properly. The squeegee down sensor did not activate.

NOTE: *Verify error source through GUI diagnostics.*

What you may observe	Potential problem	Action
1. Squeegee lift motor cycles until it actuates the up switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using GUI diagnostics and replace if necessary
2. Squeegee is up and did not lower	1. Broken wire or loose connection at motor or at electronic enclosure 2. Loose Cam 3. Squeegee motor failure	1. Repair connection 2. Tighten set screw on the “flat” of the motor shaft 3. Verify motor function using GUI diagnostics and replace if necessary

Error Message - Table 7-3:

The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too low.

NOTE: *Verify error source through GUI diagnostics.*

What you may observe	Potential problem	Action
1. No pressure reading from digital pressure sensor	1. Broken wire or loose connection at sensor or at electronic enclosure	1. Repair connection
	2. Pressure sensor failure	2. Verify sensor function using GUI diagnostics and replace if necessary
	3. Pump does not run	3. **Option 1**: Blown fuse, replace fuse and check wire connections **Option 2:** Broken wire or loose connection at pump or at the electronic enclosure, repair connection **Option 3**: Verify pump function using GUI diagnostics and replace if necessary
2. System pressure below limit for required operating pressure	1. Air inside the conditioning system	1. Cycle conditioner with vent valve and oil pressure control valve open
	2. Bad tube fitting connection	2. **Option 1:** make sure tube is cut at 90° angle, **Option 2:** make sure tubing is seated properly in fitting. If both are correct replace fitting.
	3. Oil pressure control valve failure	3. Verify oil pressure control valve function using GUI diagnostics and replace if necessary.
	4. Incorrect accumulator pressure	4. Check for 10 psi pressure at the accumulator (call BTS)
	5. Pump by-pass failure	5. **Option 1**: Adjust by-pass (call BTS); **Option 2:** Replace pump

Error Message - Table 7-4:

The lane machine is not ready for operation.
The oil pressure is not set properly. The oil pressure is too high.

NOTE: *Verify error source through GUI diagnostics.*

What you may observe	Potential problem	Action
1. System pressure above limit for required operating pressure	1. Broken wire or loose connection at oil pressure control valve or at the electronic enclosure	1. Repair connection
	2. Pressure control valve failure	2. Verify oil pressure control valve function by using GUI diagnostics and replace if necessary.
	3. Pressure sensor failure	3. Verify sensor function using GUI diagnostics and replace if necessary.

Error Messages - Table 7-5:

A communication error occurred.

NOTE: *Verify error source through GUI diagnostics.*

What you may observe	Potential problem	Action
1. This error message may occur when the lane machine is on the approach or at the foul line.	1. Broken wire or loose connection between the GUI (com 2 port) and electronics enclosure (user interface connector).	1. Check connection at either end of cable and repair if necessary
	2. Damaged PCB or other electrical problem inside electronics enclosure or GUI.	2. Call BTS

Error Messages that Appear During Operation (on the lane)

Error Message - Table 7-6:

An error occurred during operation.
The Encoder Sensor is not working properly. The machine is not moving.

NOTE: *Verify error source through GUI diagnostics.*

What you may observe	Potential problem	Action
1. Machine does not move (traction drive wheels slipping)	1. Machine not seated properly onto lane	1. Reposition Envoy onto lane surface
	2. High gutters, bumpers or wide lanes	2. **Option 1:** Lower gutters **Option 2:** Replace or repair bumpers **Option 3:** Adjust the front/rear transition/ guide rollers
	3. Excess cleaner causing wheels to slip	3. Check squeegee adjustment See Adjusting the squeegee blade for more information
	4. Too much oil	4. Check pattern settings and conditioner settings
	5. Squeegee too low	5. Check squeegee adjustment See Adjusting the squeegee blade for more information
	6. Traction drive wheels binding against frame	6. Check for loose set screws at traction drive wheels
2. Machine does not move (traction drive wheels not turning)	1. Blown fuse	1. Replace fuse and check wire connections
	2. Broken wire or loose connection at motor or at the electronic enclosure	2. Repair connection
	3. Traction drive motor failure	3. Verify motor function using GUI diagnostics and replace if necessary
3. Rear shaft does not turn	1. Rear shaft bearing blocks not aligned	1. Re-align bearing blocks and carefully tighten
	2. Rear shaft is bent	2. Replace shaft
	3. Rear wheels binding against bearing blocks	3. Adjust one wheel 1/16” away from sleeve bearing by loosening set screws on wheel
	4. Rear shaft noise	4. Replace rear shaft if bent
4. Distance encoder sensor failure	1. Broken wire or loose connection at sensor or at the electronic enclosure	1. **Option 1**: Repair connection **Option 2:** Verify sensor function using GUI diagnostics and replace if necessary
5. Distance encoder sensor out of adjustment	1. Loose sensor or mounting hardware	1. Tighten hardware and verify adjustment *See Adjusting the distance encoder for more information*
	2. Loose mounting hardware for the rear shaft	2. Tighten hardware and verify adjustment

Error Message - Table 7-7:

An error occurred during operation.
The Cord Kill Switch is not working properly. The Cord Kill Switch was activated.

NOTE: Verify error source through GUI diagnostics.

What you may observe	Potential problem	Action
1. Power cord is obstructed		1. Make sure that power cord has free movement as it travels 2. Do not step on cord while machine is in operation
2. Cord kill switch malfunction	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Cord kill switch failed 3. Cord kill switch is out of adjustment 4. Cord kill stud tension is incorrect	1. Repair connection 2. Verify switch function using GUI diagnostics and replace if necessary 3. Position switch mounting bracket so the switch is activated by the cord kill stud (1/32” to 1/16” from switch housing) 4. Adjust cord kill stud to 70 pounds of pulling force to activate the switch (compressed length of heavy spring is 3/4”)

Error Message - Table 7-8:

An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush down sensor was not activated.

NOTE: Verify error source through GUI diagnostics.

What you may observe	Potential problem	Action
1. Buffer brush lifting motor cycles until it actuates the up switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using GUI diagnostics and replace if necessary
2. Buffer brush is up and did not lower	1. Loose cam 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Buffer brush lifting motor failure	1. Tighten set screw on the “flat” of the motor shaft 2. Repair connection 3. Verify motor function using GUI diagnostics and replace if necessary

Error Message - Table 7-9:

An error occurred during operation.
The Buffer Brush is not working properly. The Buffer Brush up sensor did not activate.

NOTE: Verify error source through GUI diagnostics.

What you may observe	Potential problem	Action
1. Buffer brush lifting motor cycles until it actuates the down switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using GUI diagnostics and replace if necessary
2. Buffer brush is down and did not raise	1. Loose cam 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Buffer brush lifting motor failure	1. Tighten set screw on the “flat” of the motor shaft 2. Repair connection 3. Verify motor function using GUI diagnostics and replace if necessary

Error Message - Table 7-10:

An error occurred during operation.
The Squeegee is not working properly. The Squeegee Up sensor did not activate.

NOTE: Verify error source through GUI diagnostics.

What you may observe	Potential problem	Action
1. Squeegee motor cycles until it actuates the down switch	1. Broken wire or loose connection at switch or at the electronic enclosure 2. Failed switch	1. Repair connection 2. Verify switch function using GUI diagnostics and replace if necessary
2. Squeegee is down and did not raise	1. Loose cam 2. Broken wire or loose connection at motor or at the electronic enclosure 3. Squeegee lifting motor failure	1. Tighten set screw on the “flat” of the motor shaft 2. Repair connection 3. Verify motor function using GUI diagnostics and replace if necessary

Error Messages - Table 7-11:

An error occurred during operation.
The Duster cloth is not working properly. The Duster cloth up sensor did not activate.

NOTE: Verify error source through GUI diagnostics.

What you may observe	Potential problem	Action
1. Duster cloth is down and did not raise	1. Duster cloth not attached properly to the waste core	1. Check attachment
	2. Duster cloth supply roll turns easily	2. Tighten clutch torque bolt See Adjusting the duster clutch for more information
	3. Duster cloth supply roll is not able to turn	3. Option 1: Loosen clutch torque bolt See Adjusting the duster clutch for more information Option 2: Replace friction pad(s)
	4. Broken wire or loose connection at switch, motor or at the electronic enclosure	4. Repair connection
	5. Failed switch	5. Verify switch function using GUI diagnostics and replace if necessary
	6. Failed duster motor	6. Verify motor function using GUI diagnostics and replace if necessary
	7. Plastic plug on end of duster cloth waste core is not properly engaged into drive hub.	7. Check that duster cloth is not restricting the plastic plug from full engagement with roll pin in drive hub. Also check staples are not loose between plug and core.

Error Message - Table 7-12:

An error occurred during operation.
The End of Lane Sensor was not received when expected. Reset the lane length counter on the counters screen, then check the End of Lane Sensor.

NOTE: The above message is generated when the machine forward travel stops and reverses before the end of the pin deck.

NOTE: Verify error source through GUI diagnostics.

What you may observe	Potential problem	Action
1. LED on end of lane sensor is not lit	1. Improper Height	1. Adjust Height See Adjusting the end-of-lane sensor for more information
	2. Improper Sensitivity Adjustment	2. Adjust Sensitivity See Adjusting the end-of-lane sensor for more information
	3. Pin deck out of spec, defective pin spot, or missing lane plug	3. Option 1: Adjust or repair pin deck Option 2: Replace pin spot or missing lane plug
	4. Failed Sensor	4. Verify sensor function using GUI diagnostics and replace if necessary

Error Messages - Table 7-13:

Other error messages

NOTE: Verify error source through GUI diagnostics.

These messages begin... The lane machine is not ready for operation…	**Potential problem**	**Action**
An error occurred during the pattern parameter download	1. Changes to the existing pattern parameters did not download correctly to the machine	1. Exit the screen and try again
Invalid pattern parameters were sent to the controller or the pattern parameter BTS is bad	1. The lane machine cannot operate with the current pattern parameters	1. Download the pattern again 2. Contact the BTS or your Brunswick installer for the lane machine
Flash packet write error	1. The controller could not write the BTS data to the flash memory	1. Turn off the power, restore the power and try running again.
An error occurred during the pattern download	1. The desired lane conditioning pattern did not download correctly to the lane machine.	1. Turn off the power, restore the power and download the pattern again.
Power lost	1. Machine is unplugged, the power switch on the enclosure is off, or the emergency stop switch has been depressed. 2. Defective machine control pcb.	1. Check that the power cord is plugged into a working outlet and that all power switches are turned on. 2. Contact the BTS or your Brunswick installer of the lane machine.
The cleaner pressure is not set properly. The cleaner pressure is low.	1. The pressure for the cleaner is set below 15 psi. 2. Dirty bowl filter in the cleaner system. 3. Tubing not pressed into the fittings completely or not trimmed at a 90 degree angle - allowing air into the system.	1. Follow the adjustment; Cleaner Pinch Valve Adjustment 2. Remove bowl filter, inspect, clean or replace as required. ***Note: debris accumulates on the inside of this screen filter and may not be viewable from the outside.*** 3. Check tubing connections - reseat in the fitting or re-trim as needed.
The controller board did not respond within the required time period.	1. There is a communication problem with the controller pcb 2. The operator did not respond to a machine command within the allowable time frame.	1. Press “ok” then re-enter the screen and try again 2. Press “ok” then re-enter the screen and try again
Battery voltage is too high	Charger is exceeding the set maximum voltage for the battery type	1. Verify the correct Battery Type Jumper 2. Disconnect the battery charger from the machine - turn on the heater to lower the voltage. 3. replace the charger - consult with BTS first

Error Messages - Table 7-13: Continued

These messages begin... The lane machine is not ready for operation…	**Potential problem**	**Action**
Limited Lanes Remaining!	For the selected battery type, the voltage is getting low and may not be able to run lanes much longer	1. Determine if you are close enough to finish the lanes (2-3 lanes from finishing) 2. Plug in the battery charger to charge the battery 3. Disconnect the Battery cable from the electrical enclosure, connect the AC/DC power supply to the electrical enclosure and plug in the AC power cord.
Battery voltage is too low to run lanes	For the selected battery type, the voltage is too low to continue running the lanes	1. Plug in the battery charger to charge the battery 2. Disconnect the Battery cable from the electrical enclosure, connect the AC/DC power supply to the electrical enclosure and plug in the AC power cord.

WARNING MESSAGES

Warning messages appear when certain parameters are incorrect for proper operation. Maintenance messages are warning messages generated by counters that track when wearable parts have reached their usage limits covered in the next section.

The images in Figure 7-17 are examples of warning messages the GUI may display.

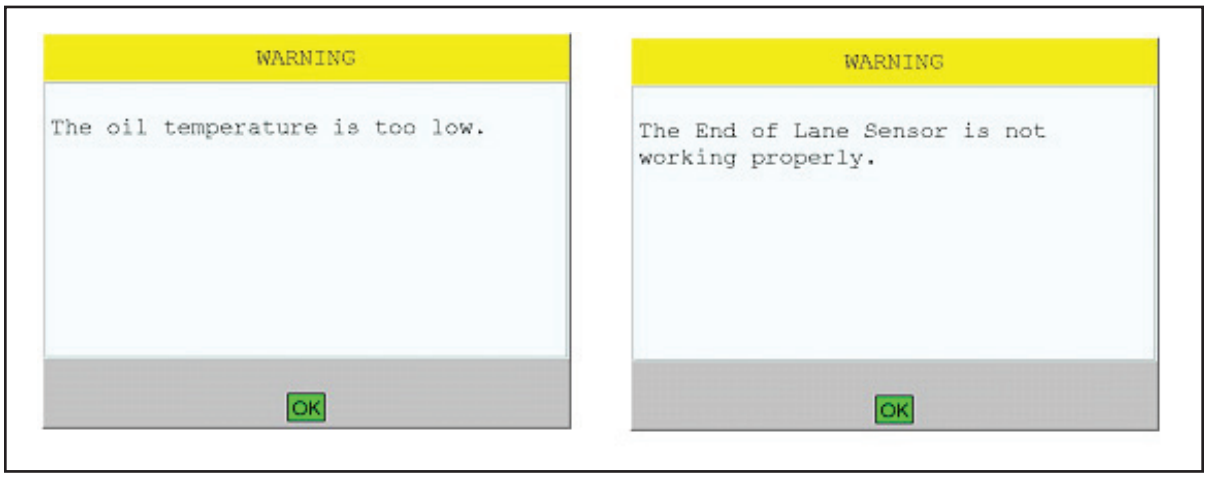


Figure 7-17. GUI Warning Messages

Table 7-14 provides a list of warning messages with potential remedies. If you're unable to resolve a problem, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

NOTE: Maintenance logs can be backed up to a USB flash drive as explained earlier in Section 4, "Backing Up and Importing Data". These logs may contain information that is helpful to Brunswick Technical Support when troubleshooting issues. They can explain how to attach backup files to an e-mail or ship the USB flash drive with your center maintenance logs. The maintenance logs, counters and critical center data cannot be imported back to your GUI.

Warning Messages - Table 7-14.

NOTE: Verify error source through GUI diagnostics.

These messages begin... **The lane machine is not ready for operation…**	**Potential problem**	**Action**
The oil level is low. Add more oil to the tank.	1. Conditioner Level 2. Level sensor is unplugged at the tank or electronic enclosure 3. Level sensor has failed	1. Add conditioner to the conditioner supply tank 1" from the top 2. Reconnect the cable 3. Verify sensor function using GUI diagnostics and replace if necessary
The cleaner level is low. Add more cleaner to the tank	1. Cleaner level is low 2. Level sensor is unplugged at the tank or electronic enclosure 3. Level sensor has failed	1. Add cleaner to the cleaner supply tank 1" from the top 2. Reconnect the cable 3. Verify sensor function using GUI diagnostics and replace if necessary
The oil temperature is too low (Only occurs when the "Temperature cycle" function is turned "ON")	1. Conditioning system has not reached the target temperature. 2. Temperature sensor or the heating element is unplugged. 3. Temperature sensor or heating element has failed	1. Press "OK" to bypass message and continue heating or allow system to reach the target temperature 2. Reconnect the cable 3. Verify sensor or heating element using GUI diagnostics and replace if necessary
The oil temperature is too high	1. Conditioning system has exceeded the target temperature 2. Heater is always on	1. Go to the System settings and turn "OFF" the Temperature Cycle 2. **Option 1:** Check voltage going to heater **Option 2:** Check LED function on motor control board
The end of the lane sensor was elevated too early The end of the lane sensor may be faulty	1. End of lane sensor is out of adjustment 2. End of lane sensor is unplugged	1. **Option 1:** Check height and sensitivity adjustments The end of lane sensor may be faulty. See Adjusting the end-of-lane sensor for more information **Option 2:** Check for excess gap between lane panels and pin deck, missing plugs, or gutters that are too high (raising the front of machine). Have qualified maintenance person address lane or gutter repairs. 2. Reconnect cables

MAINTENANCE MESSAGES

Maintenance messages, as detailed in Table 7-15, tell you when a consumable part has reached its usage limit. We recommend you perform the necessary maintenance as soon as the message occurs. You can, however, override the message if necessary. For example: until you have completed all lanes.

To override a maintenance message, press “OK.” The message continues to display each time the machine is prepared for operation, until the maintenance is completed and the counter is reset.

Once you have checked or replaced the part, reset the counter in the “Counters” screen of the Maintenance menu. Navigate to the expired counter reset and press “OK.” Refer to Figure 7-18.

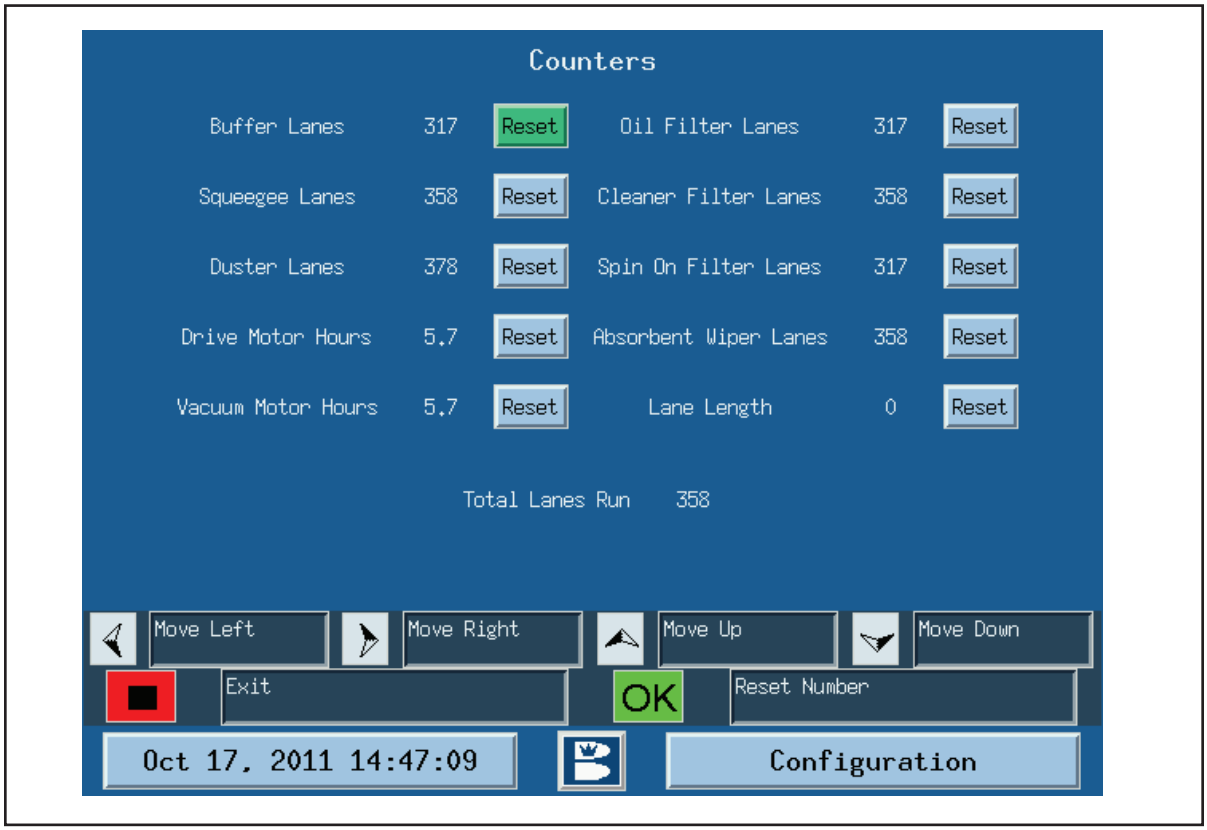


Figure 7-18. Maintenance Messages

Quick-list of Maintenance Counters

Buffer Lanes	29,200 lanes
Squeegee Lanes Replace	14,600 lanes
Duster Lanes	700 lanes
Oil Filter Lanes	29,200 lanes
Cleaner Filter Lanes	29,200 lanes
Spin-On Filter Lanes	29,200 lanes
Absorbent Wiper Lanes Replace	5,000 lanes
Drive Motor Hours	5,000 hours
Vacuum Motor Hours	500 hours
AGM Battery	400 cycles
Lithium Battery	1,600 cycles
Lane Length	As Needed

Maintenance Messages - Table 7-15.

These messages begin… A hardware counter has expired…	**Action**
Duster cloth needs to be replaced	Replace the duster cloth, select reset and press “OK” ***See Replacing the duster cloth for more information.***
The buffer brush needs to be replaced	Replace the buffer brush, select reset and press “OK” ***See Replacing the buffer brush for more information***
The squeegee blade needs to be replaced	Replace the squeegee blade, select reset and press “OK” ***See Replacing the squeegee blade for more information***
The cleaner screen filter needs to be replaced or cleaned	Clean or replace the cleaner screen filter, select reset and press “OK” ***See Replacing/cleaning the conditioner/in-line strainer for more information***
The conditioner spin-on filter needs to be replaced	Replace the conditioner spin-on, select reset and press “OK” ***See Replacing the spin-on conditioner filter for more information***
The traction drive motor needs to be replaced	Service and replace the traction drive motor select reset and press “OK”
The vacuum motor assembly needs to be replaced	Service and replace the vacuum motor assembly select reset and press “OK”

MECHANICAL FAILURES

Tables 7-16 through 7-21 provide a list of possible mechanical failures and the steps to correct them. If you need assistance, please contact your authorized Distributor or Brunswick Technical Support (BTS) in the United States at 1-800-YES-BOWL, or internationally at 231-725-4966. For non emergency support, e-mail techsupport@brunbowl.com

List Of Mechanical Failure Categories

Duster Cloth Assembly - Table 7-16
Cleaning System - Table 7-17
Conditioning Appearance & Application - Table 7-18
Traction Drive System - Table 7-19
Electrical System - Table 7-20
GUI - Table 7-21

Duster Cloth Assembly - Table 7-16

NOTE: Verify error source through GUI diagnostics.

Problem	Cause	Solution
Machine leaving lines of dust on the lane.	1. Duster cloth is too wet	1. **Option 1:** Verify correct cleaner pressure. **Option 2:** Adjust spray nozzles away from duster cloth.
	2. Duster clutch is too tight, cloth is not advancing	2. Loosen clutch adjustment ***See Adjusting the duster cloth for more information***
Duster cloth is not dusting entire lane.	1. Duster contact roller is not lowering completely	1. **Option 1:** Check for binding in roller movement. **Option 2:** Check for uneven winding of cloth.
	2. Duster contact roller has flat spots or depressions	2. **Option 1:** Replace contact roller cushion tube. **Option 2:** Check lane for topography problems.
Duster assembly chatters on back of lane	1. Contact roller cushion has a flat spot	1. Replace contact roller cushion tube
Duster cloth is dragging on lane during return run	1. Clutch is adjusted too loose	1. Tighten clutch adjustment per manual ***See Adjusting the duster cloth for more information***
	2. Loose hub on duster cloth motor shaft	2. Tighten set screw in hub
	3. Hub on take up core is loose and slipping	3. Repair or replace hub on cardboard take up core
	4. Duster cloth motor failure	4. Verify motor function using GUI diagnostics and replace if necessary

Cleaning System - Table 7-17

NOTE: Verify error source through GUI diagnostics.

Problem	Cause	Solution
Lane is not getting clean (Cleaner spray system problems)	1. Obstruction in cleaner supply tank	1. Check inside supply tank for foreign matter
	2. Clogged cleaner screen filter	2. Remove cleaner screen filter, clean or replace as needed
	3. Cleaner pump not running	3. **Option 1**: Verify operation using maintenance screen **Option 2:** Check for correct voltage at cleaner pump plug **Option 3:** Check for bad fuse on motor controller PCB **Option 4:** Check for bad wire or plug connection **Option 5:** Replace cleaner pump
	4. Blockage in one or more cleaner spray nozzles	4. **Option 1:** Clean with hot water or replace check valve filter; **Option 2:** Clean with hot water or replace spray tip
	5. Cleaner supply tank empty	5. Adjust low fluid sensor by turning to allow for clean vertical drop, or replace
	6. Low cleaner spray system pressure	6. **Option 1**: Adjust max pressure to 19 psi **Option 2:** Adjust min pressure to 17 psi **Option 3:** Verify cleaner screen filter is not clogged **Option 4:** Replace cleaner bypass Valve **Option 5:** Replace cleaner pump
	7. Cleaner spray nozzle(s) not properly adjusted	7. **Option 1:** Perform cleaner spray test in maintenance menu test screen **Option 2:** Adjust cleaner spray nozzles so spray in a straight line across the lane with even overlap. Align ball join if necessary (call BTS).
	8. Poor water quality	8. Use a charcoal filter to filter impurities when mixing cleaner
	9. Improper cleaner or mix ratio	9. Try using a higher mix concentration of cleaner (4:1) or call BTS for advice on the proper cleaner for your type of conditioner.

Cleaning System - Table 7-17 - Continued

Problem	Cause	Solution
Lane is not getting clean (Squeegee head assembly problems)	1. Worn absorbent wiper	1. Turn, flip, or replace based on condition
	2. Improperly adjusted squeegee head assembly	2. Use adjusting template to perform adjustment and check squeegee blade deflection on the lane. ***See Adjusting Squeegee for more information***
	3. Worn squeegee blade	3. Turn or replace based on condition
	4. Poor vacuum seal	**4. Option 1:** Adjust vacuum mounting bracket plate **Option 2:** Replace vacuum seal
	5. Poor performance of vacuum motor	5. Repair or replace vacuum motor
	6. Waste recovery tank is over full	6. Empty waste recovery tank
	7. Dirty cleaner drips on return	**7. Option 1:** Vacuum hose cuffs are not tight around the in-take pipe of the squeegee head assembly or on the waste recovery tank **Option 2:** Vacuum exhaust diffuser foam is not in proper position or needs to be cleaned or replaced. **Option 3:** Squeegee blade is not clamped straight

Conditioning Appearance & Application - Table 7-18

Problem	Cause	Solution
One or more conditioner injectors are not firing	1. Unplugged conditioner injector cable	1. **Option 1:**Reconnect plug to conditioner injector **Option 2:** Reconnect plug at electronic enclosure
	2. Defective conditioner injector, wire, connection, or PCB	2. Contact BTS for troubleshooting support.
Injector marks not blended on lane surface	1. Buffer brush out of adjustment	1. Refer to Buffer Brush Adjustment for more information
	2. Dispersion roller out of adjustment	2. Refer to Dispersion roller adjustment for more information
	3. Buffer brush not rotating	3. **Option 1**: Tighten buffer brush bolt **Option 2:** Verify and adjust buffer belt tension
	4. Defective buffer brush	4. Verify buffer brush lane counter and replace if necessary
	5. Buffer drive motor not operating	5. **Option 1:** Verify fuse condition, and replace is necessary **Option 2:** Verify motor function using GUI diagnostics and replace if necessary
Tape readings different than programmed units	1. Wrong conditioner selected in the System Conditioner screen	1. Select the correct lane conditioner – if not listed contact Brunswick BTS
	2. Conditioning system not holding pressure	2. Verify pressure through GUI diagnostics, if machine is not holding pressure contact the Brunswick BTS
	3. Lane surface is not getting cleaned properly	3. Check cleaning system adjustments ***Refer to Cleaning System Adjustment for more information***
	4. Duster contact roller dragging in pattern	4. Adjust duster clutch
	5. Buffer brush worn or out of adjustment	***5. Refer to Buffer Brush Adjustment for more information***
	6. Lane monitor not working properly	6. Contact the Brunswick BTS

NOTE: Verify error source through GUI diagnostics.

Problem	Cause	Solution
Noise coming from the drive system	1. The traction motor chain is not aligned properly	1. Adjust sprockets until the chain is aligned correctly
	2. Traction motor chain is too loose or too tight	2. Adjust traction drive motor until there is a 1/2” movement in the chain
	3. Too much traction drive shaft movement from side to side	3. Adjust traction drive wheels 1/16” from bearing blocks
	4. Bent traction drive shaft	4. Verify shaft is bent, replace if necessary
Travel Speed is incorrect or inconsistent	1. Wrong speed selected in the Pattern, Design, Forward Speed option	1. Make sure the desired Forward Speed is selected
	2. Electrical issue (low voltage)	2. Contact Brunswick BTS or contact your certified Envoy technician
Not traveling down lane	1. Traction wheels not in contact with lane	1. **Option 1:** Verify squeegee head assembly adjustment ***Refer to Squeegee Head Assembly Adjustment for more information*** **Option 2:** Verify guide rollers, adjust guide roller spacing if necessary **Option 3:** Verify proper gutter height, repair if necessary
	2. Traction drive motor is not operating	2. **Option 1:** Verify fuse condition, and replace if necessary **Option 2:** Verify motor function using GUI diagnostics and replace if necessary

WARNING! ***Always unplug power cord from the machine before servicing or lifting machine into transport position.***

Problem	Cause	Solution
No power to electronics enclosure	1. Battery not charged, connected	1. Check battery charge and connection
	2. Main switch on the electronic enclosure is turned “OFF”	2. Turn on main switch (switch should illuminate when “ON”)
	3. Emergency shut-off switch button is depressed	3. Twist the Emergency shut-off switch to disengage
Trips in-line breakers	1. Bad wire connection in power supplied to machine	1. Check all connections in the power cord and power cable assembly to electronic enclosure
	2. Incorrect wiring at outlet when using AC power option	2. Check for incorrect polarity at power outlets where machine plugs in, and repair if necessary
	3. Short in electrical system	3. Contact Brunswick BTS
	4. Waste fluid overflow into vacuum motor	4. Clean waste fluid from vacuum motor and empty waste recovery tank at proper intervals.
Blown fuse	1. Bad or pinched wire or cable assembly	1. Repair or replace cable assembly
		2. Replace with correct size fuse
	2. Wrong fuse size	***See Appendix for electrical drawings***
	3. Improper adjustment of component	3. Adjust chain, belt, or check for binding of component(s) related to the fuse

GUI - Table 7-21

Problem	Cause	Solution
No power to GUI	1. Power is disconnected at the GUI or the electronic enclosure	1. Reconnect cable
	2. Emergency shut-off switch is depressed	2. Twist the Emergency shut-off switch to disengage.
	3. Power cord is not plugged in if using AC power	3. Check the 125' power cord is properly connected at both ends.
	4. Main switch on the side cover is turned off	4. Turn on main switch on side cover.
	5. Battery is not charged	5. Connect charger to machine
GUI reboots when changing outlets	1. Uninterruptable Power Supply (UPS) is not charged (LED does not blink when turned off)	1. Supply power to GUI for 4 hours
	2. Failed UPS Board	2. Contact Brunswick BTS

Section 8: Pattern Design Theory

PATTERN DEVELOPMENT

The Envoy pattern design theory is based on Brunswick's history of understanding the relationship between bowling balls, lane conditioners, and lane surfaces. Coupled with the new Accu-ject™ innovation it is now possible for centers to truly customize their lane conditioner patterns to better benefit the bowlers and their bowling balls.

Accu-ject innovation allows accurate placement of conditioner nearly every inch of the pattern so you can design and adjust specific areas of the conditioner patterns without affecting the entire pattern. This makes the process of setting up and adjusting patterns much quicker than existing machines. You simply select the zone that you wish to design or adjust and set the oil level to the desired volume and shape.

The Envoy's forward only conditioner application is an enormous benefit for creating not just good ball reaction, but great ball reaction. Since the conditioner is applied on the forward travel, the pattern transition down the lane will always be smooth and allows the ball to store more energy for the back end of the lane. Unlike other machines that rely on reverse conditioner application to create the lengthwise taper of a pattern. Reverse conditioner creates inconsistencies, within the pattern, that causes the bowling ball to release its energy inconsistently as it travels down the lane, storing less for the back ends. This action is responsible for making patterns less predictable and bowler adjustments more difficult. Follow these important steps to develop proper lane maintenance practices and a great conditioner pattern for you center.

1. Identify your bowling environment.
   The bowling environment holds many variables that can affect your lane surface. The surface type, age, and name of the surface or finish, give it specific ball reaction characteristics. The condition of the kickbacks and kickback plates and the solidness of the pin deck and flat gutters can affect pin movement.

2. Recognize your geographic region.
   The region of the world in which you live can dictate how you need to store your equipment and supplies. To eliminate issues with varying temperatures as the seasons change, store your Envoy, conditioners, and cleaners in a room that has temperature control. Conditioners can become thicker and cleaners can crystallize when they become cold. This can increase the preparation time to set up the machine and possibly affect the characteristics of the products. The amount of dirt your center produces can affect lane pattern.

3. Frequency of general maintenance.
   All centers should perform general maintenance to the bowling area on a daily basis. Though, we know that is not always true, you should recognize how dirty your environment is and structure a maintenance program accordingly. Dust and dirt can affect the performance of a conditioner pattern making it appear that it is breaking down faster. Dust migrates with the air flow and dirt is transferred by the bowlers and the balls. Keeping the floors and carpets clean, the approaches and gutters clean, along with pinsetter maintenance, will help the performance of the bowlers and the conditioner pattern.

4. Your bowlers.
   Bowlers are a product of their environment. How they bowl and what they throw is based on what they bowl on. Bowlers vary between recreational to competitive bowlers and everywhere in between. Setting up appropriate patterns for various customers can minimize pinsetter issues and allow you to use your supplies more efficiently.

5. Choose the correct supplies.
   This is the most important step in consistent lane conditions. It is also the most forgotten. The correct choices in supplies can make the difference between happy or unhappy customers. Making the proper choice is sometimes not so easy. A conditioner should provide good durability, have minimal movement down the lane (carry down), and clean easily. Always use a "bowling" specific lane cleaner. Cleaners should be designed to remove the type of conditioner you are using. Not all cleaners will clean all conditioners. Synthetic conditioners require cleaners with d-limonene while standard conditioners can use a standard bowling lane cleaner. If the lanes are not clean, then the pattern will not be consistent.

Understanding a Conditioner Pattern

The proper design of the conditioner pattern is critical to making your customers happy. Here are some tips to help you understand key components for developing patterns.

1. Pattern length.
   Typical pattern lengths used today range between 36 to 42 feet. Although we do see pattern lengths both shorter and longer for tournaments, the distance should be determined by the back end hook characteristic of your lane surface.

2. Lengthwise taper.

   The lengthwise distribution of the conditioner pattern influences the quality of ball reaction. The greater the taper, from the beginning to the end of the pattern, results in more smooth and predictable ball reaction. The lengthwise ratio usually ranges from 3:1 to 5:1 and is measured by the "units of oil" in the front (heads) of the pattern divided by the units of oil measured at the end of the pattern (i.e. 75 unit and 15 units equals a 5:1 ratio). The proper taper will help store the ball energy, making the pins come alive and improving the strike percentage. Refer to Figure 8-1.

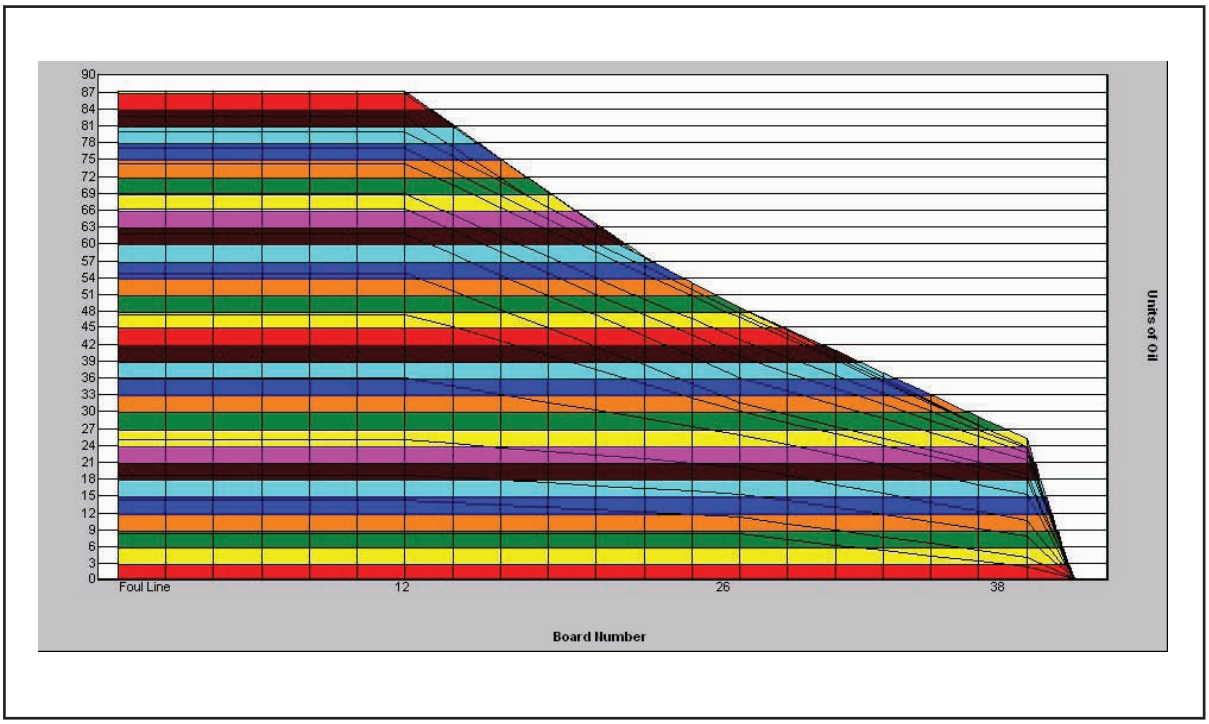


Figure 8-1. Lengthwise Taper

3. Crosswise shape.
   The crosswise shape of the pattern influences the scoring difficulty level. It is measured by the amount conditioner on the center boards divided by the amount on the outside boards. Ratios can range from 5:1 to 10:1 for recreational league patterns and 3:1 or less for sport patterns. The higher the ratio, the higher the scores typically are. The crosswise shape is based on lane surface and bowler characteristics. Refer to Figure 8-2.

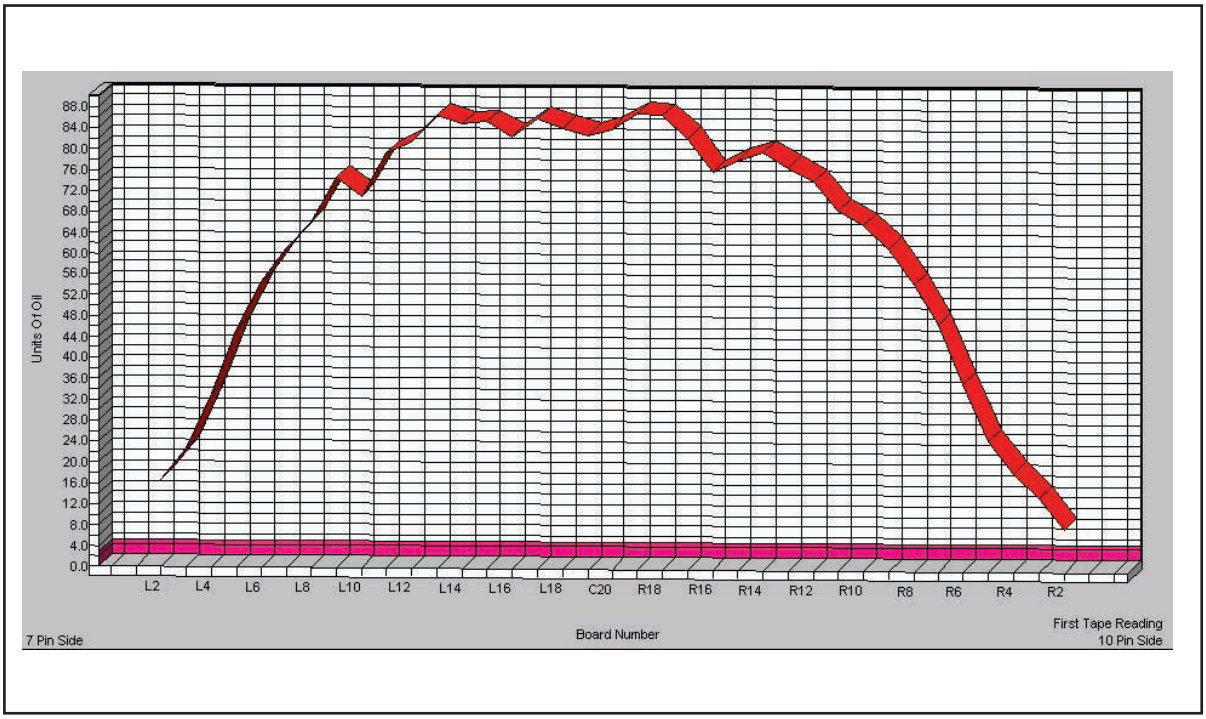


Figure 8-2. Crosswise Shape

Design a Conditioner Pattern

Pattern design with the Envoy has become a lot easier. We have given you the control over the patterns you deserve in the language you are accustomed to… units of oil.

1. Zone configuration
   The zone configuration allows you to design patterns with a minimum of one zone to a maximum of eight zones. Zone lengths can range from 3 feet to 57 feet. Recreational patterns can vary from 3 zones to 5 zones with zone lengths from 8 feet to 12 feet. The last zone in the pattern should always be a buff zone to help optimize the lengthwise taper of the pattern. Adjust the cleaner transition so the volume of cleaner reduces at least two feet into the last zone. Sport and competitive patterns utilize 5 to 8 zones with zone lengths ranging from 5 feet to 10 feet. Again, the last zone should be a buff zone. The cleaner transition should be adjusted to two feet past the pattern ending distance to ensure that the pattern is properly cleaned. Refer to Figure 8-3.

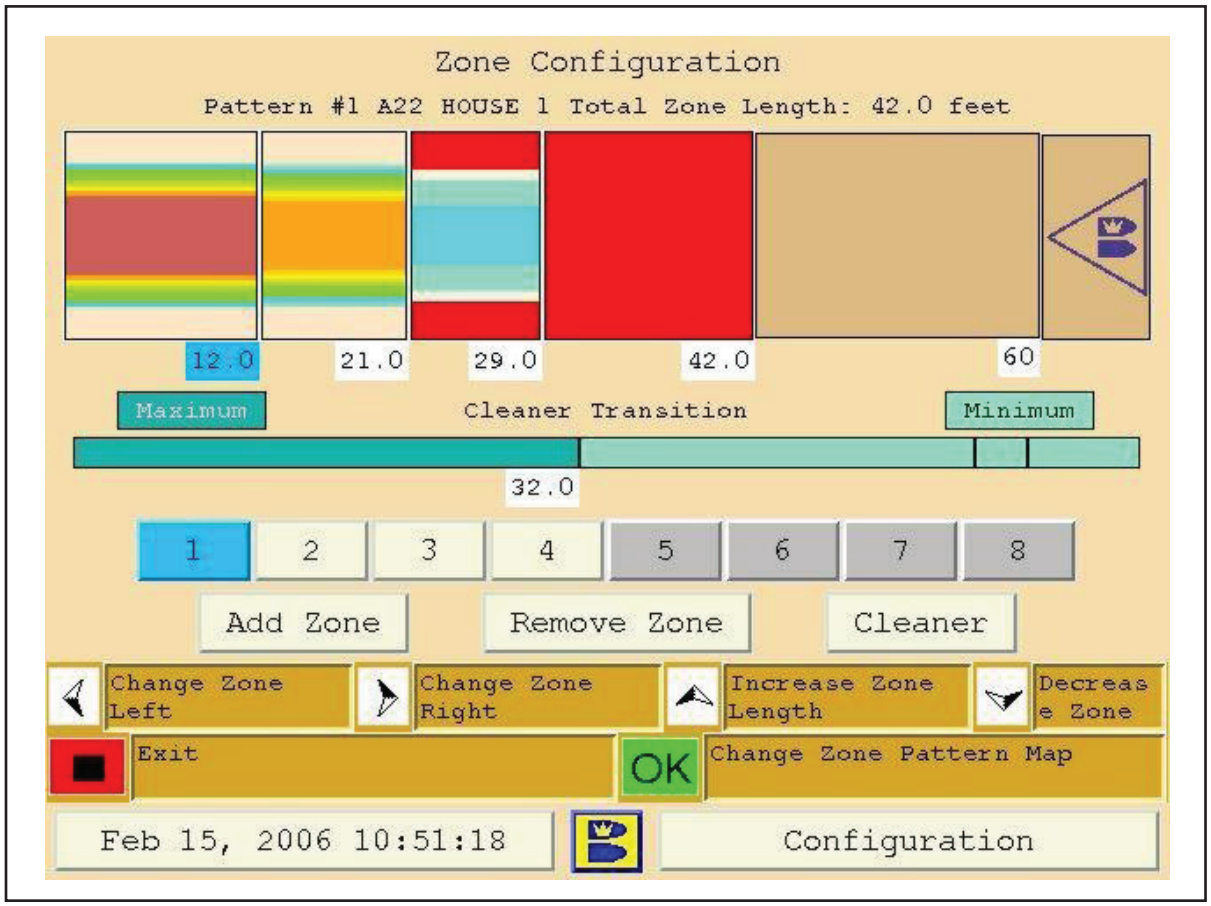


Figure 8-3. Zone Configuration

2. Oil levels

The oil levels screen allows you to create the shape and levels of the conditioner pattern in units of oil. Minimum and maximum levels range from 0 to 100 units. To create the proper lengthwise taper of a pattern, oil levels, from zone to zone, should decrease between 15% and 30%. This is the same for sport and recreational patterns. The percent decrease from zone to zone depends on the starting oil level in the first zone. If the first zone conditioner level is lower (60 units or less) the percentage decrease in the following zones will be smaller and if the first zone conditioner level is higher (above 60 units), the percentage of decrease is higher. The last zone or buff zone should have 1 to 3 units set in the oil level screen on at least one board. This allows the machine to buff the remaining zone of the pattern, in both directions, without injecting conditioner and enhance the lengthwise taper. Set all boards for zero (0) and the machine will buff the last zone in the forward direction of travel only. This increases the lengthwise taper even more. Refer to Figure 8-4.

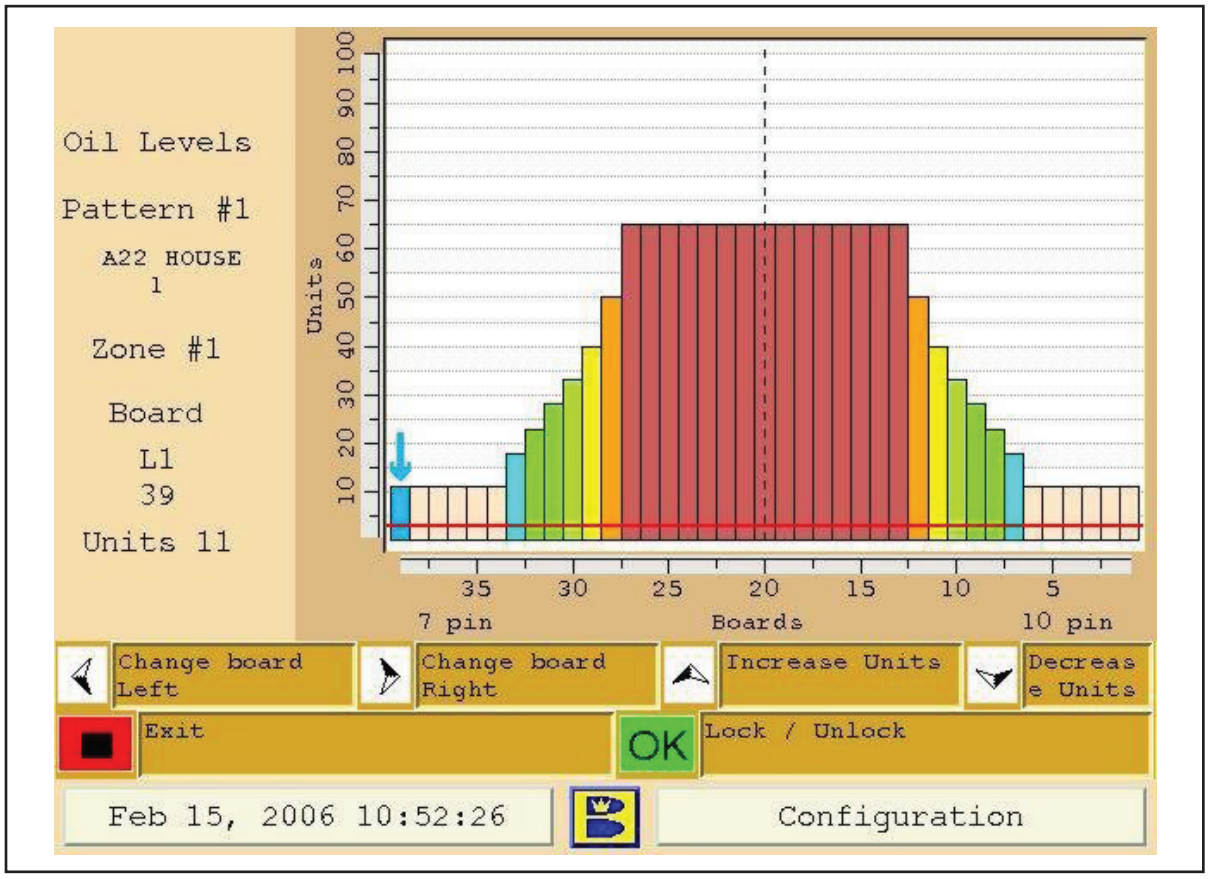


Figure 8-4. Oil Levels

Verifying the Conditioner Pattern

Verification of the conditioner pattern is a step used to qualify the pattern you are using. It allows you to see that the Envoy is consistently producing a conditioner pattern based on what is programmed in the Pattern Design screens. It also allows you to identify wear components such as, the absorbent wiper, squeegee, or buffer brush. All of which can have an effect on the units of oil and the performance of a pattern as they have exceeded their life. To verify the conditioner pattern follow these steps.

1. Verify that the machine is cleaning properly before performing the verification process.
2. Select the zone or zones you wish to verify.
3. After running a few lanes, take a tape sample of the conditioner pattern, one foot before the end of that zone (i.e. zone #2 ends at 15 feet, tape distance is 14 feet).
4. Read the tape using the Brunswick Computer Lane Monitor.
5. Compare the lane monitor readings to the programmed units of oil in the GUI.

Adjusting the Conditioner Pattern

The Envoy allows you to make adjustments to specific area of the conditioner pattern without having to make unnecessary adjustments to the rest of the pattern. Adjustments to the conditioner pattern should be made based on ball reaction. The ball reaction should be observed when the pattern is fresh and as it transitions as lineage increases. If the pattern transition is not as desired, refer to the follow procedure for making adjustments.

1. Identify the area of the pattern that is not performing properly.
2. Go to the pattern design screen and view the Zone Configuration and Oil Levels screens.
3. Select the zone that corresponds with the area of the lane that needs adjustments.
4. Make adjustments to the zone length or to the oil levels to change the pattern transition.
5. Download the pattern.
6. If the pattern adjustments are successful, go to the Pattern Data screen and save the pattern data to a backup file folder.

ENVOY FACTORY PRESET PATTERNS

The Envoy comes complete with 10 factory preset patterns to accommodate the ever changing bowling environment and customer needs. The patterns include an Envoy starting pattern and nine Gold Crown patterns from the Brunswick Pattern Library. Pattern difficulties range from recreation patterns to sport patterns and a something in between.

Pattern 1: Envoy House
The basic starting pattern designed especially for the Brunswick Envoy. This pattern is both flexible in shape and oil levels to customize with any lane surface and provides a great scoring environment. It is a great way to compliment your customers.
Pattern Distance: 40 feet
Pattern Ratio (max): 7.4:1

Pattern 2: Crown Jewel
Wall it up at the second arrow! That is the beauty of this gem of a pattern, it is almost too easy. The Crown Jewel plays so nice that it will surpass the brilliance of the greatest jewels ever found. Have fun and enjoy the fantastic reaction you will get with this pattern.
Pattern Distance: 41 feet
Pattern Ratio (max): 5:1

Pattern 3: EZ 1.0
If you want it, here it is…come and get it. You better hurry 'cause their scoring fast! EZ as pie, this is the epitome of "stand left and throw right" (or visa versa). The narrow shape helps benefit centers with surface or topography issues that do not support a breakpoint outside of the 10 board.
Pattern Distance: 42 feet
Pattern Ratio (max): 9:1

Pattern 4: Score King
The Score King pattern has been designed to accommodate centers whose environment supports a breakpoint further outside. The 39 foot distance helps enhance the shape of the pattern and creates a superb entry angle that will only benefit scores. It is good to be king, even for just one day.
Pattern Distance: 39 feet
Pattern Ratio (max): 5.9:1

Pattern 5: Inferno
This pattern is "on fire" from the beginning. Multiple angles allow different styles of players to compete together for their drive to perfection. The strong lengthwise taper creates predictable ball motion. The first transition will be mellow and all players need to do is follow the second transition (breakdown) to keep from getting burned.
Pattern Distance: 39 feet
Pattern Ratio (max): 4.4:1

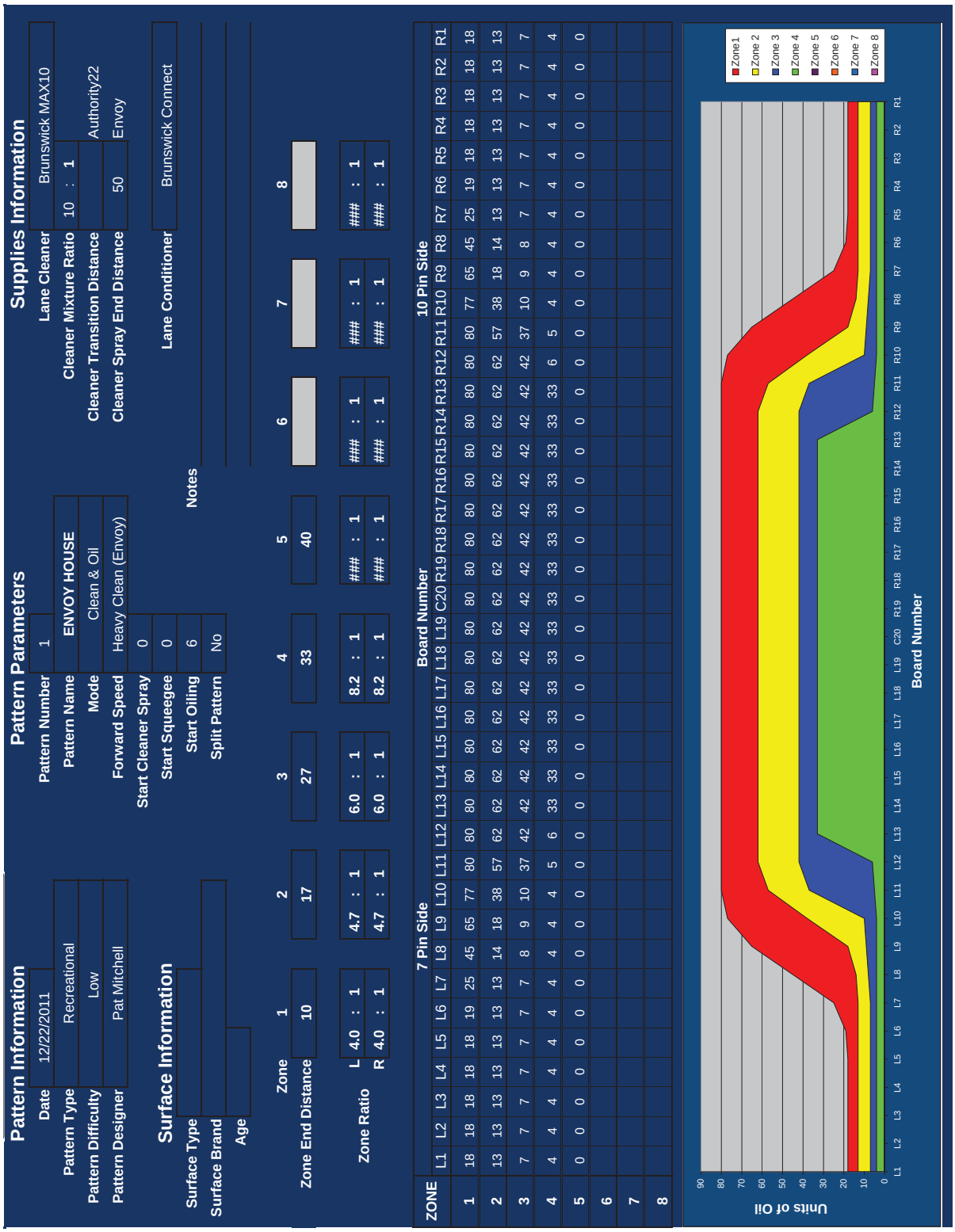
Pattern 6: Rhino
Beware…this pattern is ready to charge! It's shorter length and wider girth offers players a chance to create transition and learn to stretch the patterns like the big boys. Get into rhythm and stay in the zone and your competition will have a difficult time keeping up.
Pattern Distance: 37 feet
Pattern Ratio (max): 3.3:1

Pattern 7: The Deep
Remember the early days of the megabuck tournaments? Players were forced to play deep inside and open up the lane. It is a blast from the past but teaches a valuable less on how to play "no man's land". Don't be afraid to stand in front of the ball return, lads and lassies, the Deep offers a valuable lesson for players wanting more experience under their belt.
Pattern Distance: 42 feet
Pattern Ratio (max): 3.5:1 (L), 4.2:1 (R)

Pattern 8: Edge
Edge is simply the highest scoring sport pattern possible. Used as the base pattern for the 2010 Brunswick Euro Challenge, it allows players to play the "edge" of the lane (aka the gutter). The 40 foot length allows the players to start fast and stay fast through all the games. However, sport pattern strategies apply here as well. Players that try to use recreation or house strategies may not be happy!
Pattern Distance: 40 feet
Pattern Ratio (max): 1.8:1

Pattern 9: Phantom
Through the darkness of the flat pattern comes a force of guidance, the 43 foot Phantom pattern, with a strong lengthwise taper, aided by a little shape to the front of the pattern, will make it a bit more bearable. However, the lane surface will still dictate the type of sport strategy the player must apply. Flat Pat gives the Phantom two thumbs up!
Pattern Distance: 43 feet
Pattern Ratio (max): 1.4:1

Pattern 10: Phase 1
Phase 1 is designed to emphasize the first phase of pattern transition…carry down! How the players attack the short pattern will dictate the type of transitions. The transition can either reward or penalize the players. Sport pattern strategies are required here!
Pattern Distance: 36 feet
Pattern Ratio (max): 2.4:1


Pattern Information
Date 12/22/2011
Pattern Type Recreational
Pattern Difficulty Low
Pattern Designer Pat Mitchell
Surface Information
Surface Type
Surface Brand
Age
Pattern Parameters
Pattern Number 1
Pattern Name ENVOY HOUSE
Mode Clean & Oil
Forward Speed Heavy Clean (Envoy)
Start Cleaner Spray 0
Start Squeegee 0
Start Oiling 6
Split Pattern No
Notes
Supplies Information
Lane Cleaner Brunswick MAX10
Cleaner Mixture Ratio 10 : 1
Cleaner Transition Distance Authority22
Cleaner Spray End Distance 50 Envoy
Lane Conditioner Brunswick Connect
Zone 1 2 3 4 5 6 7 8
Zone End Distance 10 17 27 33 40
Zone Ratio L 4.0 : 1 4.7 : 1 6.0 : 1 8.2 : 1 ### : 1 ### : 1 ### : 1
R 4.0 : 1 4.7 : 1 6.0 : 1 8.2 : 1 ### : 1 ### : 1 ### : 1
7 Pin Side
10 Pin Side
Board Number
ZONE
Units of Oil
Board Number
Zone1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
Zone 7
Zone 8

Pattern Information

Date	12/1/2012
Pattern Type	Recreational
Pattern Difficulty	Low
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	CROWN JEWEL
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	43	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	9	18	25	32	41			
Zone Ratio L	4.1 : 1	4.6 : 1	4.6 : 1	5.0 : 1	### : 1	### : 1	### : 1	### : 1
Zone Ratio R	4.1 : 1	4.6 : 1	4.6 : 1	5.0 : 1	### : 1	### : 1	### : 1	### : 1

ZONE	7 Pin Side / Board Number																																										
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	19	20	21	22	23	24	25	27	35	80	92	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	92	80	35	27	25	24	23	22	21	20	19
2	12	13	14	15	16	17	18	20	25	63	71	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	71	63	25	20	18	17	16	15	14	13	12
3	9	10	11	12	13	14	15	16	20	50	57	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	57	50	20	16	15	14	13	12	11	10	9
4	5	5	6	6	7	7	8	9	12	29	32	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	23	29	12	9	8	7	7	6	6	5	5
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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7																																											
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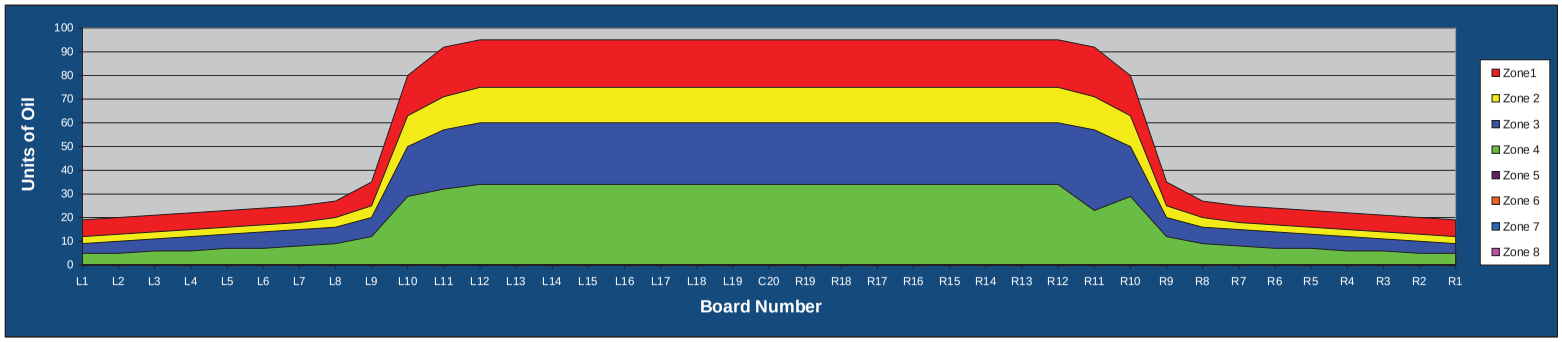

Pattern Information

Date	12/1/2012
Pattern Type	Recreational
Pattern Difficulty	Low
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	EZ 1.0
Mode	Clean & Oil
Forward Speed	Quick Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	44	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	10	17	24	30	42			
Zone Ratio L	3.6 : 1	5.0 : 1	7.8 : 1	9.0 : 1	### : 1	### : 1	### : 1	### : 1
Zone Ratio R	3.6 : 1	5.0 : 1	7.8 : 1	9.0 : 1	### : 1	### : 1	### : 1	### : 1

ZONE	7 Pin Side											Board Number																																	10 Pin Side									
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	25	25	25	25	25	25	25	25	27	45	60	75	75	75	90	90	90	90	90	90	90	90	90	90	90	75	75	75	60	45	27	25	25	25	25	25	25	25	25
2	15	15	15	15	15	15	15	15	15	17	40	60	65	65	75	75	75	75	75	75	75	75	75	75	75	65	65	60	40	17	15	15	15	15	15	15	15	15	15
3	7	7	7	7	7	7	7	7	7	7	9	40	50	50	55	55	55	55	55	55	55	55	55	55	55	50	50	40	9	7	7	7	7	7	7	7	7	7	7
4	5	5	5	5	5	5	5	5	5	5	7	25	40	40	45	45	45	45	45	45	45	45	45	45	45	40	40	25	7	5	5	5	5	5	5	5	5	5	5
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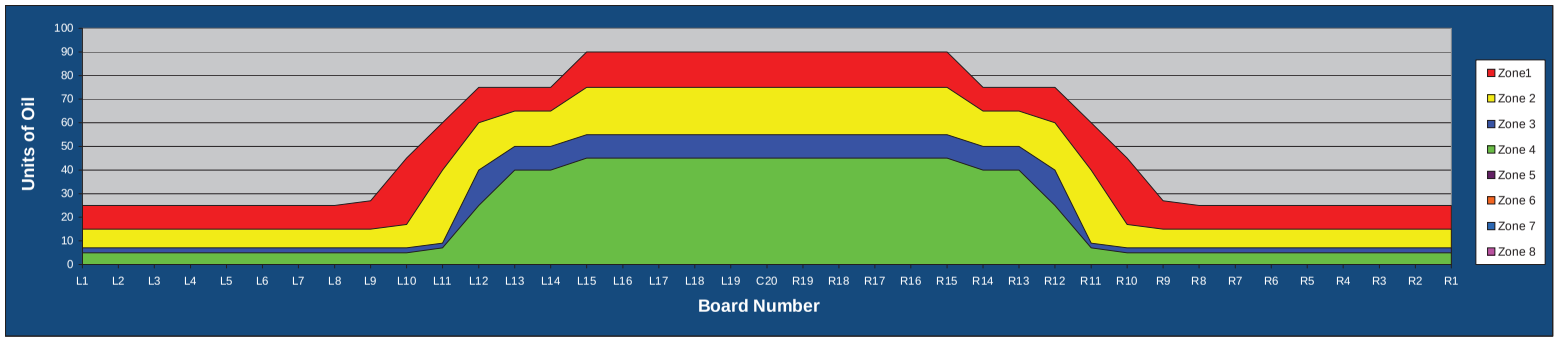

Pattern Information

Date	12/1/2012
Pattern Type	Recreational
Pattern Difficulty	Low
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	SCORE KING
Mode	Clean & Oil
Forward Speed	Quick Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	41	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	8	15	27	33	39			
Zone Ratio L	3.5 : 1	4.3 : 1	5.8 : 1	5.4 : 1	### : 1	### : 1	### : 1	### : 1
Zone Ratio R	3.5 : 1	4.3 : 1	5.8 : 1	5.4 : 1	### : 1	### : 1	### : 1	### : 1

ZONE	7 Pin Side																	Board Number																						
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	22	22	22	22	22	22	24	65	77	77	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	77	77	65	24	22	22	22	22	22	22
2	15	15	15	15	15	15	17	55	64	64	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	67	64	64	55	17	15	15	15	15	15	15
3	9	9	9	9	9	9	11	40	52	52	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	52	52	40	11	9	9	9	9	9	9
4	6	6	6	6	6	6	8	28	32	32	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	32	32	28	8	6	6	6	6	6	6
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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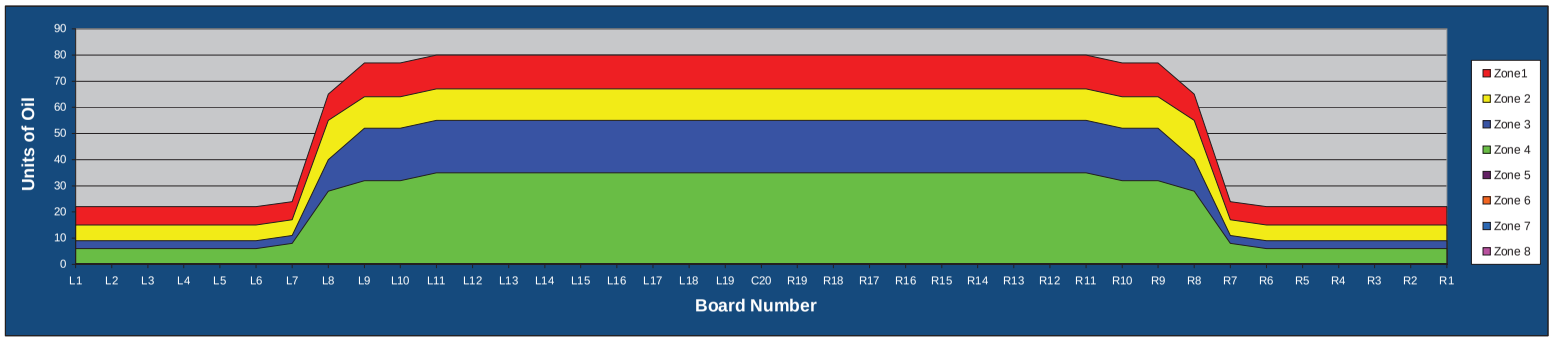


Pattern Information

Date	12/1/2012
Pattern Type	Competitive
Pattern Difficulty	Medium
Pattern Designer	Pat Mtichell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	INFERNO
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

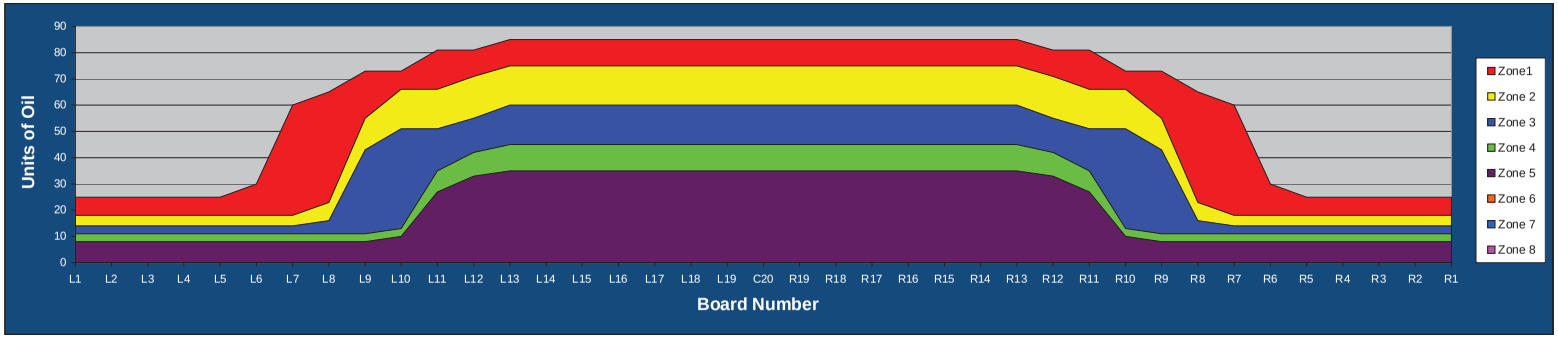
Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	41	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	8	16	22	27	32	39		
Zone Ratio L	2.5 : 1	4.1 : 1	4.2 : 1	4.0 : 1	4.3 : 1	### : 1	### : 1	### : 1
Zone Ratio R	2.5 : 1	4.1 : 1	4.2 : 1	4.0 : 1	4.3 : 1	### : 1	### : 1	### : 1

ZONE	7 Pin Side												Board Number																						10 Pin Side									
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	25	25	25	25	25	30	60	65	73	73	81	81	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	81	81	73	73	65	60	30	25	25	25	25	25
2	18	18	18	18	18	18	18	23	55	66	66	71	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	71	66	66	55	23	18	18	18	18	18	18	18
3	14	14	14	14	14	14	14	16	43	51	51	55	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	55	51	51	43	16	14	14	14	14	14	14	14
4	11	11	11	11	11	11	11	11	11	13	35	42	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	42	35	13	11	11	11	11	11	11	11	11	11
5	8	8	8	8	8	8	8	8	8	10	27	33	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	33	27	10	8	8	8	8	8	8	8	8	8
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7																																							
8																																							



Pattern Information

Date	12/1/2012
Pattern Type	Competitive
Pattern Difficulty	Medium
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	RHINO
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

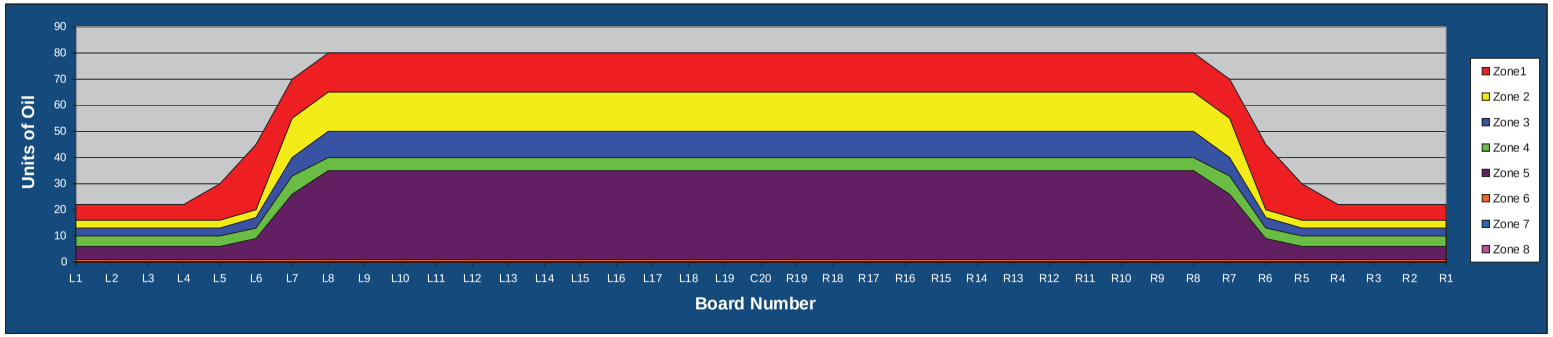
Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	39	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	7	15	21	26	31	37		
Zone Ratio L	2.1 : 1	2.6 : 1	2.6 : 1	2.6 : 1	3.3 : 1	1.0 : 1	### : 1	### : 1
Zone Ratio R	2.1 : 1	2.6 : 1	2.6 : 1	2.6 : 1	3.3 : 1	1.0 : 1	### : 1	### : 1

ZONE	7 Pin Side / Board Number / 10 Pin Side																																									
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	22	22	22	22	30	45	70	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	70	45	30	22	22	22	22
2	16	16	16	16	16	20	55	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	55	20	16	16	16	16	16
3	13	13	13	13	13	17	40	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	40	17	13	13	13	13	13
4	10	10	10	10	10	13	33	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	33	13	10	10	10	10	10
5	6	6	6	6	6	9	26	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	26	9	6	6	6	6	6
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7																																									
8																																									



Pattern Information

Date	12/1/2012
Pattern Type	Competitive
Pattern Difficulty	Medium
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	THE DEEP
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	44	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	9	18	25	33	42			
Zone Ratio L	2.7 : 1	3.5 : 1	3.3 : 1	3.0 : 1	### : 1	### : 1	### : 1	### : 1
Zone Ratio R	3.0 : 1	3.7 : 1	4.1 : 1	3.7 : 1	### : 1	### : 1	### : 1	### : 1

| ZONE | 7 Pin Side | | | | | | | Board Number | | | | | | |

Pattern Information

Date	12/1/2012
Pattern Type	Sport
Pattern Difficulty	Medium
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	EDGE
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	42	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	9	17	23	28	33	40		
Zone Ratio L	1.2 : 1	1.3 : 1	1.6 : 1	1.6 : 1	1.7 : 1	### : 1	### : 1	### : 1
Zone Ratio R	1.2 : 1	1.3 : 1	1.6 : 1	1.6 : 1	1.7 : 1	### : 1	### : 1	### : 1

| ZONE | 7 Pin Side | | | | | | | | | | | | | | | | | Board Number | | | | | | | | | | | | | | | | | | | | | | | | | 10 Pin Side | | | | | | | | | | | | | | | | | | |

Pattern Information

Date	12/1/2012
Pattern Type	Sport
Pattern Difficulty	High
Pattern Designer	Pat Mtichell

Pattern Parameters

Pattern Number	
Pattern Name	PHANTOM
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	45	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

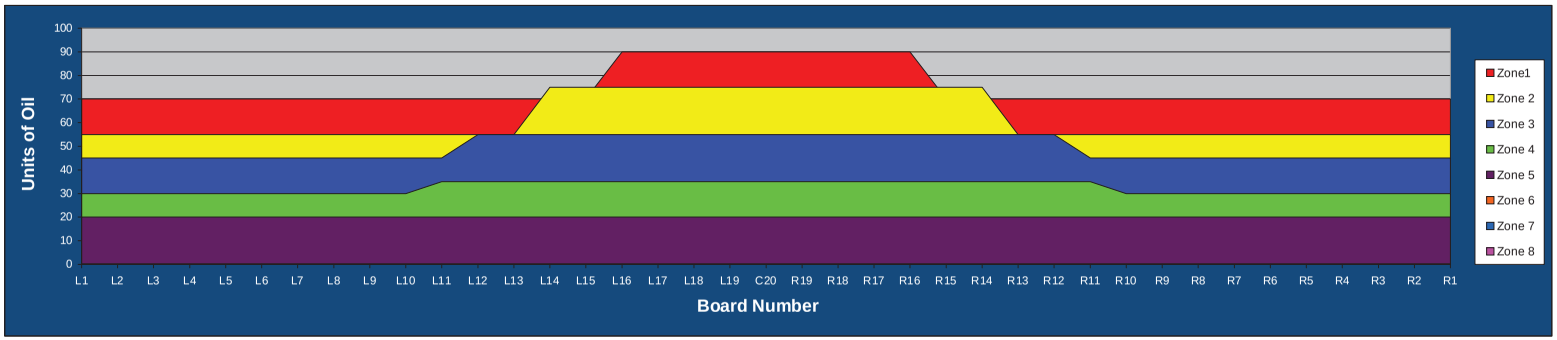
Notes

Surface Information

Surface Type	
Surface Brand	
Age	

Zone	1	2	3	4	5	6	7	8
Zone End Distance	8	16	22	34	43			
Zone Ratio L	1.2 : 1	1.3 : 1	1.2 : 1	1.1 : 1	1.0 : 1	### : 1	### : 1	### : 1
Zone Ratio R	1.2 : 1	1.3 : 1	1.2 : 1	1.1 : 1	1.0 : 1	### : 1	### : 1	### : 1

ZONE	7 Pin Side															Board Number														10 Pin Side													
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	90	90	90	90	90	90	90	90	90	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
2	55	55	55	55	55	55	55	55	55	55	55	55	55	75	75	75	75	75	75	75	75	75	75	75	75	75	55	55	55	55	55	55	55	55	55	55	55	55	55
3	45	45	45	45	45	45	45	45	45	45	45	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	45	45	45	45	45	45	45	45	45	45	45	45
4	30	30	30	30	30	30	30	30	30	30	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	30	30	30	30	30	30	30	30	30	30	30
5	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7																																							
8																																							



Pattern Information

Date	12/1/2012
Pattern Type	Sport
Pattern Difficulty	High
Pattern Designer	Pat Mitchell

Surface Information

Surface Type	
Surface Brand	
Age	

Pattern Parameters

Pattern Number	
Pattern Name	PHASE 1
Mode	Clean & Oil
Forward Speed	Max Clean
Start Cleaner Spray	0
Start Squeegee	0
Start Oiling	6
Split Pattern	No

Supplies Information

Lane Cleaner		
Cleaner Mixture Ratio	: 1	
Cleaner Transition Distance	38	Authority22
Cleaner Spray End Distance	53	Envoy
Lane Conditioner		

Notes

Zone	1	2	3	4	5	6	7	8
Zone End Distance	7	15	20	24	28	36		
Zone Ratio L	1.7 : 1	2.0 : 1	2.1 : 1	2.3 : 1	1.9 : 1	1.0 : 1	### : 1	### : 1
Zone Ratio R	1.7 : 1	2.0 : 1	2.1 : 1	2.3 : 1	1.9 : 1	1.0 : 1	### : 1	### : 1

ZONE	7 Pin Side / Board Number / 10 Pin Side																																										
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	C20	R19	R18	R17	R16	R15	R14	R13	R12	R11	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1
1	32	32	32	34	37	45	56	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	56	45	37	34	32	32	32
2	25	25	25	26	28	31	46	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	46	31	28	26	25	25	25
3	20	20	20	21	23	26	37	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	37	26	23	21	20	20	20
4	17	17	17	17	18	20	23	28	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	28	23	20	18	17	17	17	17
5	16	16	16	16	17	19	22	26	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	26	22	19	17	16	16	16	16
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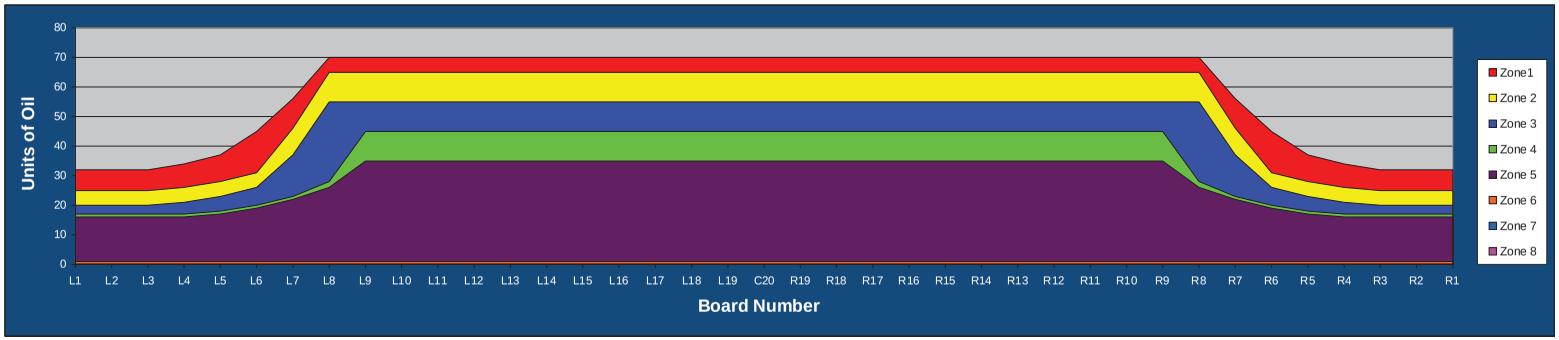
7																																											
8																																											



Appendix

This Appendix provides technical documentation that may be helpful for your general reference.

In this Appendix you will find:

1. Pre-Installation Packing List
2. A set of electrical schematics and diagrams

PRE-INSTALLATION PACKING LIST

These items should be shipped with the Envoy Lane Machine. Please call us if you are missing any items on this packing list.

Lane Machine Complete with Covers and GUI

1. 125' (38.1m) Power Cord
2. Spare Parts Kit
3. Straight Edge Alignment Tool
4. Envoy Operation & Service Manual
5. Battery Charger

Spare Parts Kit Envoy Lane Machine (14-860247-000)

The Spare Parts Kit includes all items listed below. These items can also be ordered individually, with the part number provided.

STANDARD PACKAGING

REV.	QTY.	PART NUMBER	DESCRIPTION
	1.00	11-112132-000	WRENCH - 1/4" T-HANDLE ALLEN, LONG
	1.00	11-112133-000	SCREW DRIVER - #2 PHILLIPS WITH 10" SHANK
	1.00	11-112134-000	TOOL - DUAL FUSE PULLER
	1.00	11-616025-000	SWITCH - LEVER, SPDT, .187 QUICK CONNECT
	1.00	11-616026-000	SWITCH - ROLLER LEVER, SPDT, .187, 0.1A @ 125VAC
	1.00	11-616031-000	SWITCH - PIN PLUNGER, SPDT, .187 QUICK CONNECT
	1.00	11-655013-013	TUBE - 1/4" OD X 41.00" LG. POLYETHYLENE
	1.00	11-655018-000	FITTING - UNION ELBOW, 1/4" TUBE
	2.00	11-655070-000	SPRAY TIP - 110°, .050 GPM, STAINLESS STEEL
	2.00	11-655086-000	STRAINER - 100 MESH, 5 PSI CHECK VALVE
	1.00	11-685134-000	FUSE - 40 AMP MAXI FUSE
	1.00	14-100202-000	FITTING - GREASE, DISPERSION ROLLER
	1.00	14-100378-000	FOAM - VACUUM DIFFUSER
	2.00	14-100427-000	FOAM - BUFFER SHIELD DRIP
	1.00	14-100487-000	SEAL - WASTE TANK, "D" SHAPE
	1.00	14-100557-000	FOAM - BUFFER SHIELD DRIP, HIGH PERFORMANCE
	1.00	14-860027-000	PKG - A22 PATTERN MANAGER
	1.00	14-860028-000	PKG - A22 PATTERN EDITOR
	1.00	14-860209-000	PKG. - CLEANING MIXING VESSEL W/NO SPILL SPOUT
	1.00	14-860214-000	PKG. - FUSE, 4.0A, 250V SLOW BLO, 5MM X 20MM
	1.00	14-860216-000	PKG. - FUSE, 10.0A, 250V SLOW BLO, 5MM X 20MM
	1.00	14-860218-000	PKG. - FUSE, 6.3A, 250V SLOW BLO, 5MM X 20MM
	1.00	14-860242-000	PKG-FUSE,SLOW BLOW-UL LISTED 2.0 AMP,5 X 20MM, 250V
	1.00	14-860245-000	PKG. - AC INPUT ADAPTER KIT, G.U.I.
	1.00	14-860247-700	PACKING LIST - ENVOY LANE MACHINE SPARE PARTS KIT
	1.00	14-900098-000	MANUAL - ENVOY SPARE PARTS
	1.00	14-900101-000	MANUAL - ENVOY OPERATION AND SERVICE

ELECTRICAL SCHEMATICS & DIAGRAMS

The following schematics and diagrams are provided for your reference:

1. Fuse Locations & Specifications and Output LED Locations
2. Electrical System Schematic - Left Side View
3. Electrical System Schematic - Right Side View
4. Electrical System Schematic - Rear View
5. Electronics Control Enclosure - 24VDC
6. Overall GUI Schematic
7. GUI & Handle Keypad Schematic

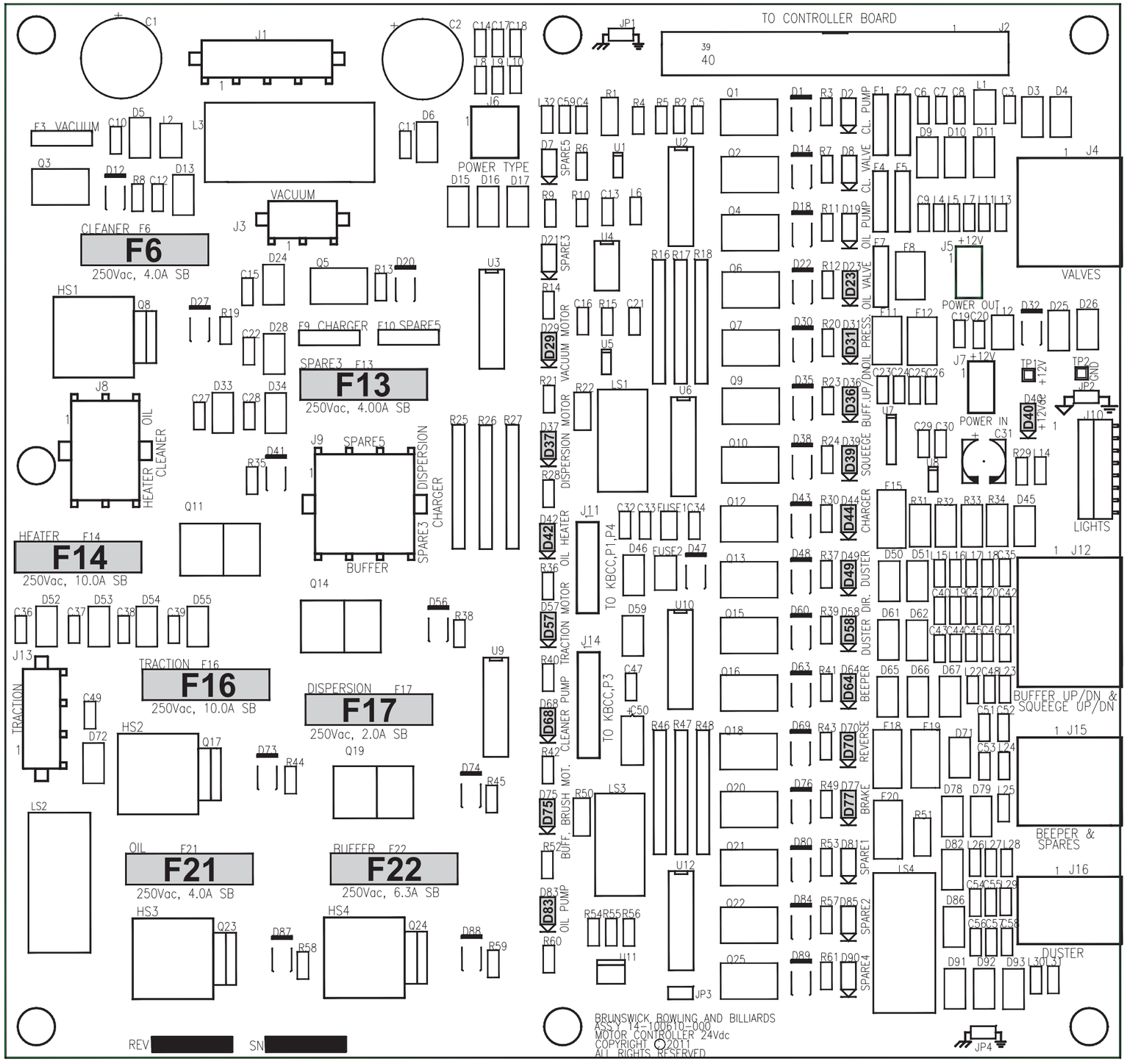


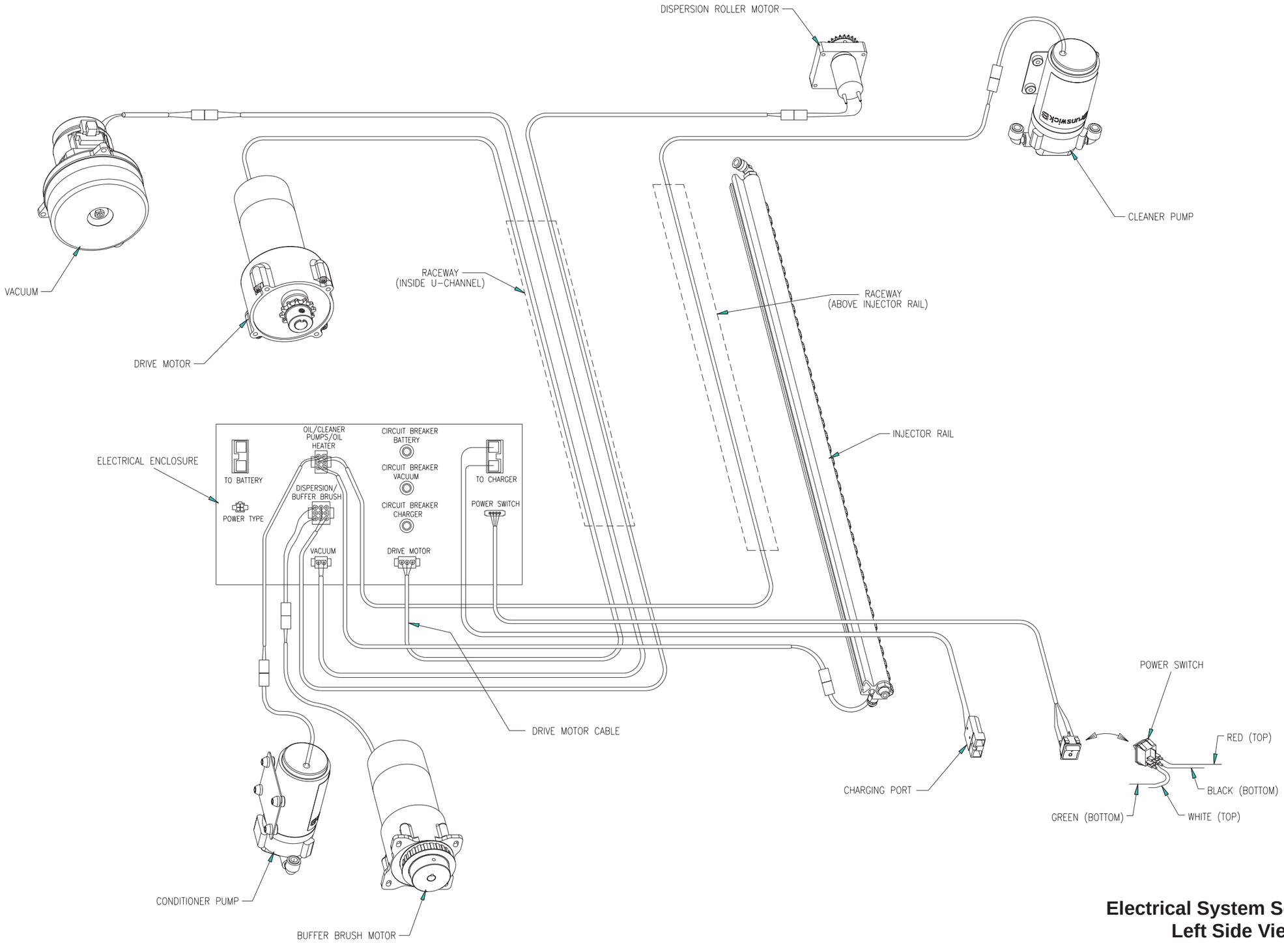
Table of Envoy Lane Machine Fuses on Motor Controller PCB (All are in Spare Parts Kit)

Locations ID	Part No.	Description	Application
F6	14-860214-000	Pkg. of 5 Fuses - 4.0A, 250V 5 x 20mm, Slow Blow	Cleaner Pump
F13	14-860214-000	Pkg. of 5 Fuses - 4.0A, 250V 5 x 20mm, Slow Blow	Spare
F14	14-860216-000	Pkg. of 5 Fuses - 10A, 250V 5 x 20mm, Slow Blow	Conditioner Heater
F16	14-860216-000	Pkg. of 5 Fuses - 10A, 250V 5 x 20mm, Slow Blow	Traction Drive Motor
F17	14-860242-000	Pkg. of 5 Fuses - 2.0A, 250V 5 x 20mm, Slow Blow	Dispersion Roller Motor
F21	14-860214-000	Pkg. of 5 Fuses - 4.0A, 250V 5 x 20mm, Slow Blow	Conditioner Pump
F22	14-860218-000	Pkg. of 5 Fuses - 6.3A, 250V 5 x 20mm, Slow Blow	Buffer Drive Motor

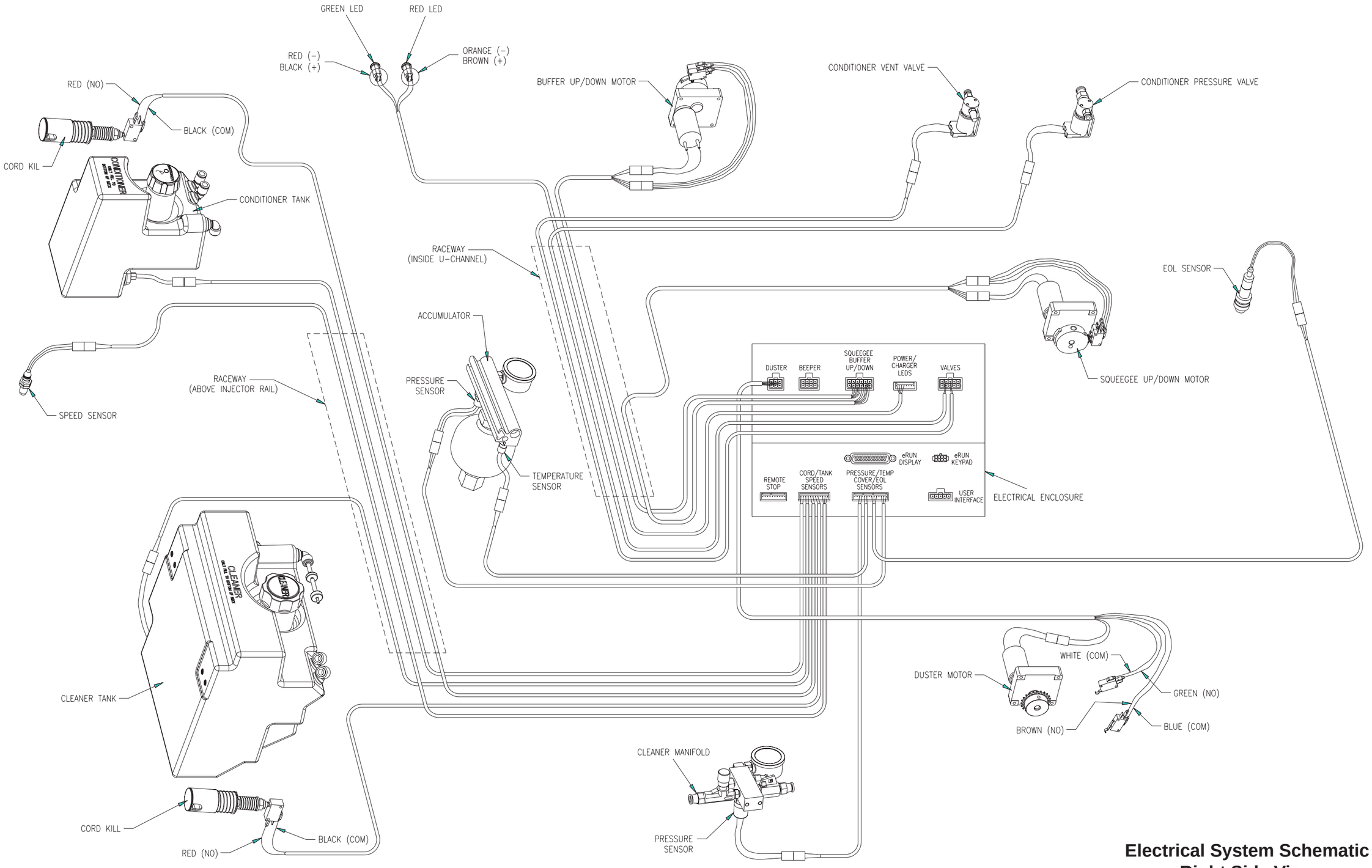
Table of Lane Machine Output LEDs on Motor Controller PCB

Locations ID	Aplication
D23	Conditioner (Oil) Vent Valve
D29	Vacuum Motor
D31	Conditioner (Oil) Pressure Valve
D36	Buffer Lift Motor
D37	Dispersion Roller Motor
D39	Squeegee Lift Motor
D40	12vdc Power to Motor Controller PCB
D42	Conditioner (Oil) Heater
D44	Battey Charger Solenoid
D49	Duster Cloth Motor
D57	Traction Drive Motor
D58	Duster Cloth Motor (up) Reverse
D64	Beeper
D68	Cleaner Pump
D70	Traction Drive Motor Reverse
D75	Buffer Drive Motor
D77	Traction Drive Motor Brake
D83	Conditioner (Oil) Pump

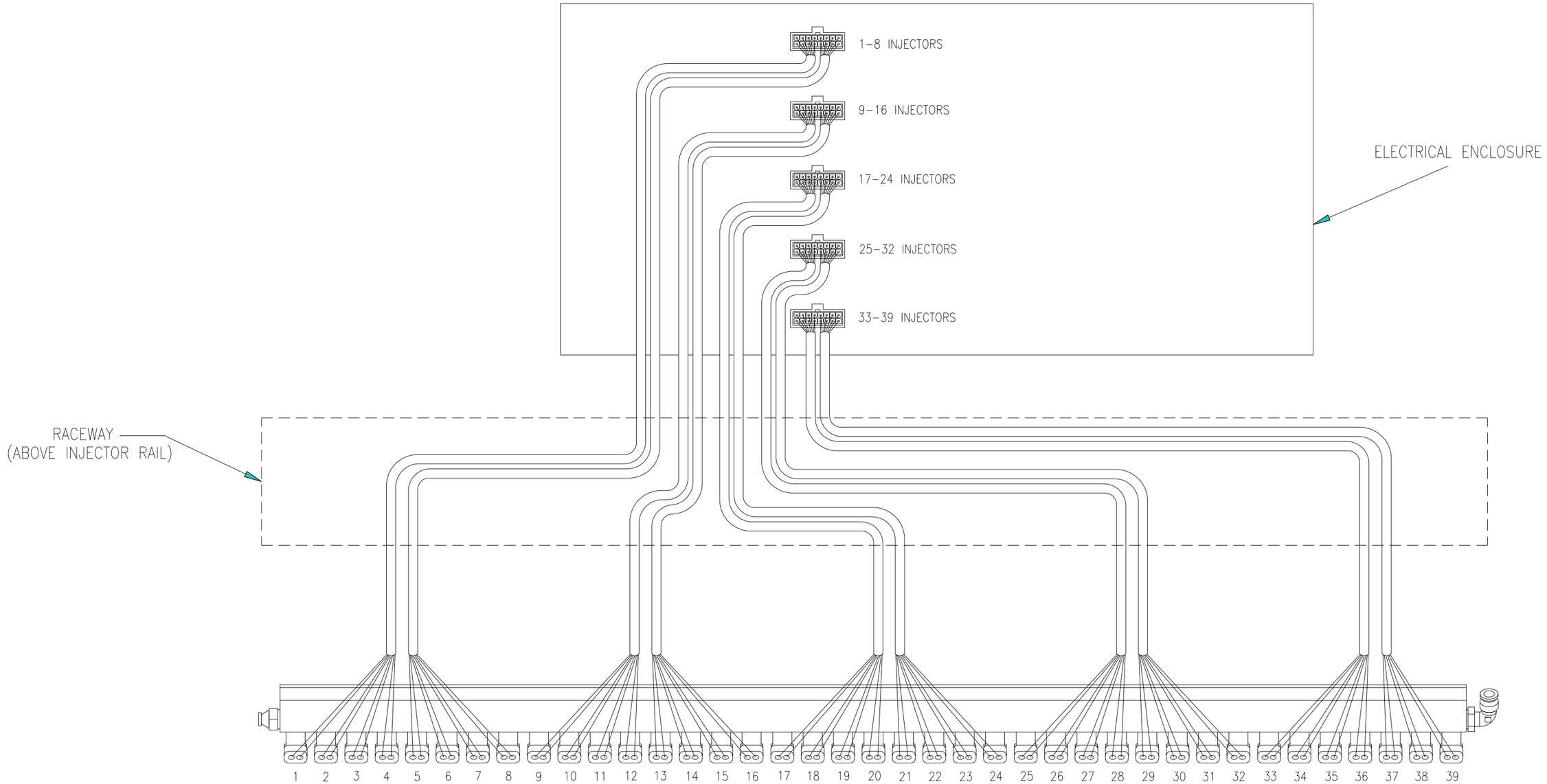
Fuse Locations & Specifications and Output LED Locations



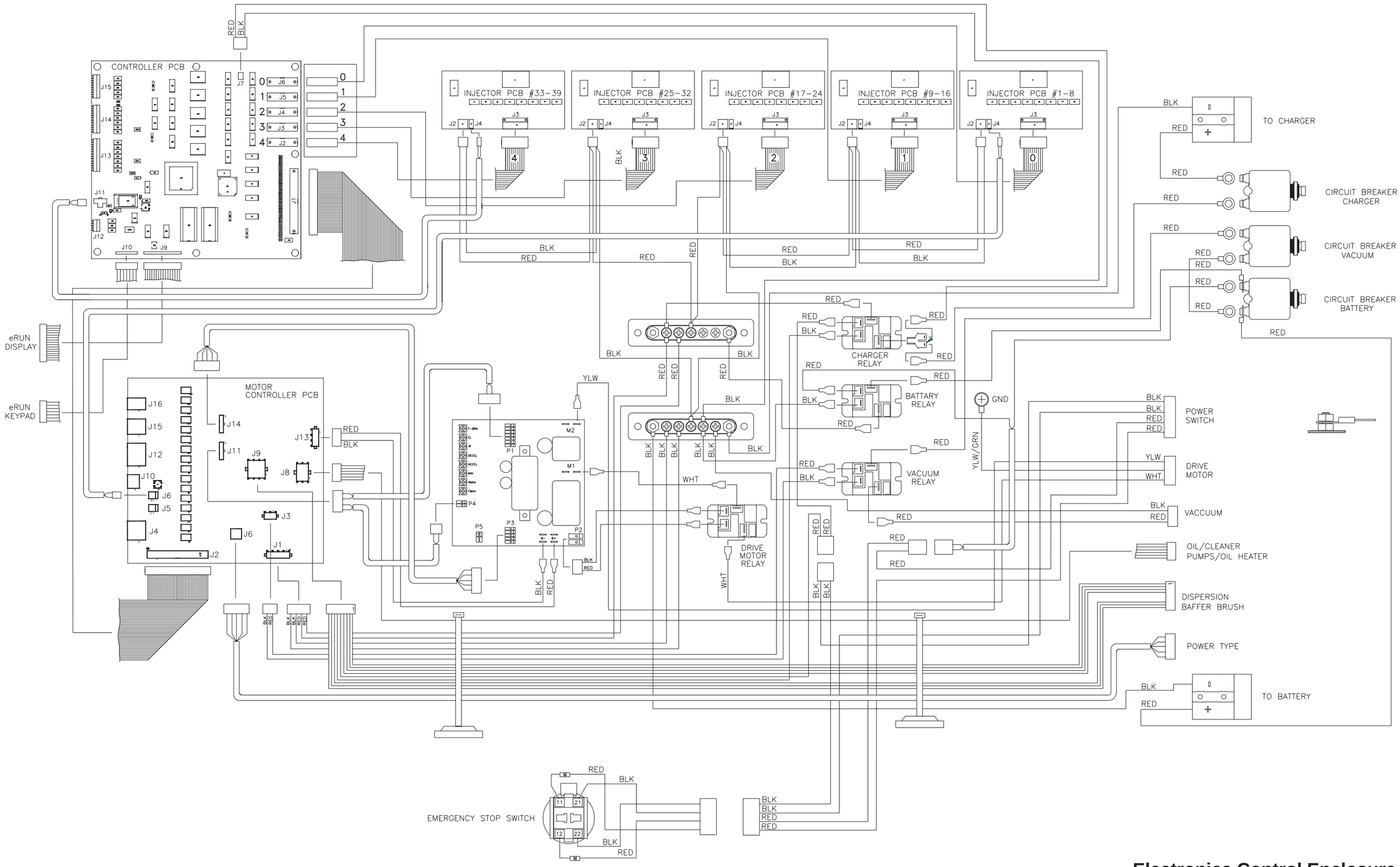
Electrical System Schematic
Left Side View



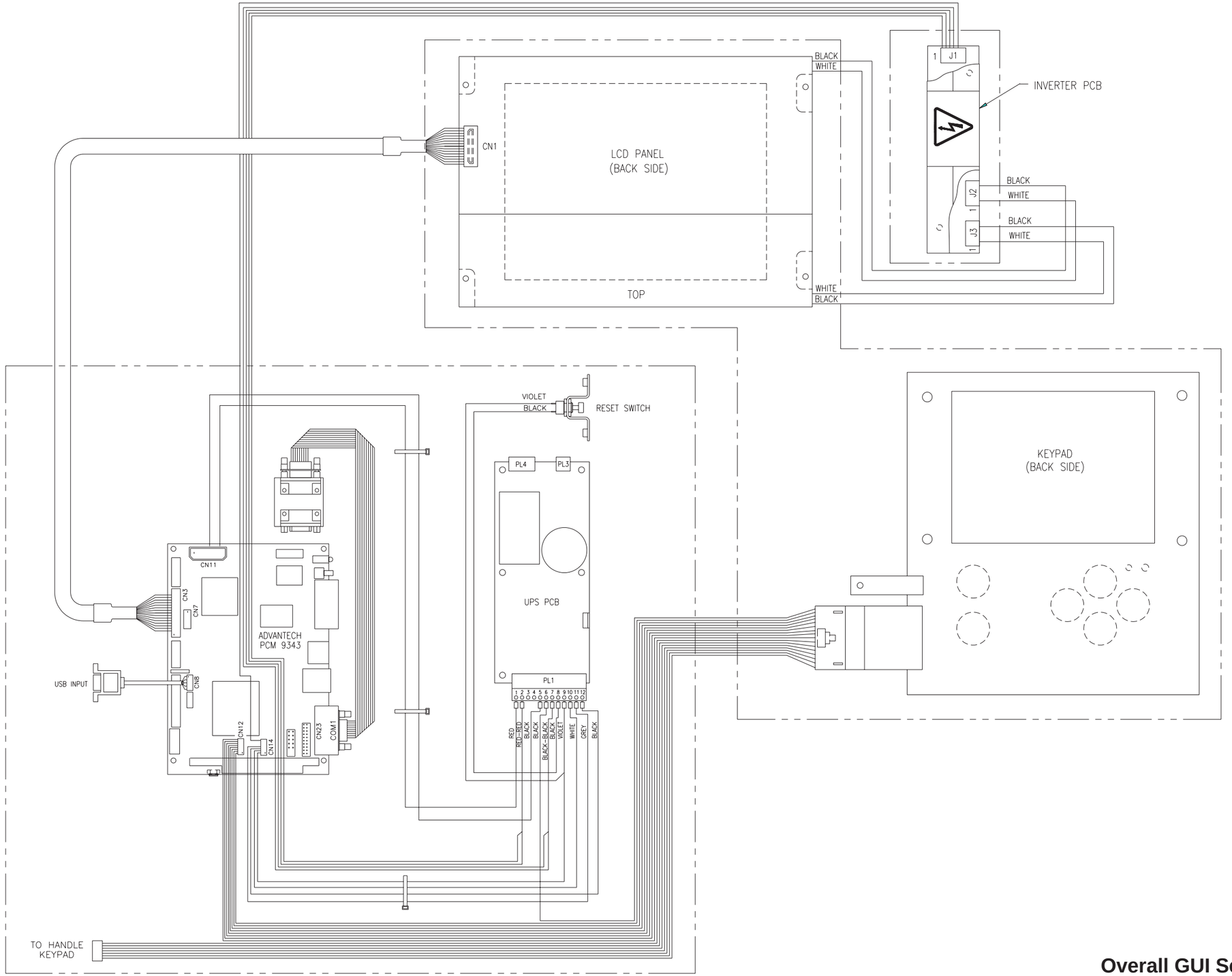
Electrical System Schematic
Right Side View


1–8 INJECTORS
9–16 INJECTORS
17–24 INJECTORS
25–32 INJECTORS
33–39 INJECTORS
ELECTRICAL ENCLOSURE
RACEWAY
(ABOVE INJECTOR RAIL)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

Electrical System Schematic
Rear View



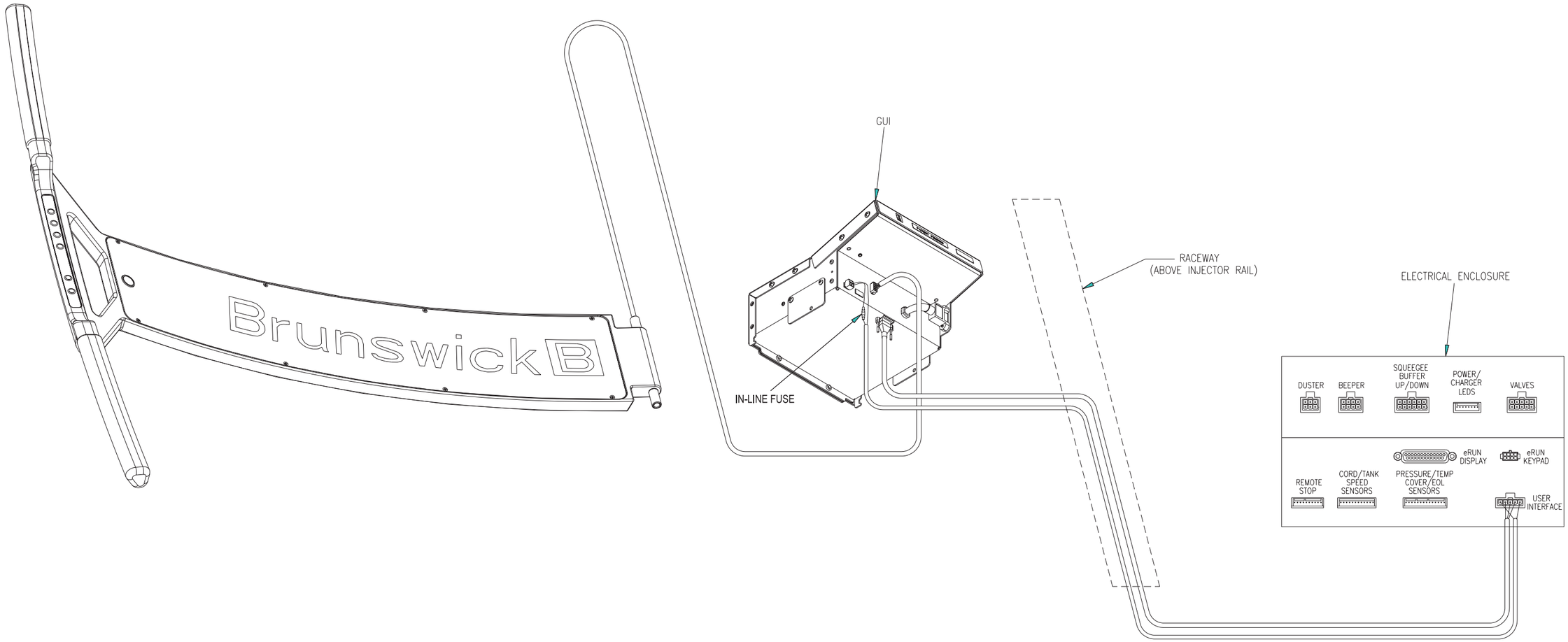
Electronics Control Enclosure
24 VDC



Overall GUI Schematic

Table for Envoy Lane Machine In-Line Fuse

Wire Harness Inline Fuse	14-860242-000	Pkg. of 5 Fuses - 2.0A, 250V 5 x 20mm, Slow Blow	GUI Input Power



GUI & Handle Keypad Schematic